

**DRAFT OF THE
IMPLEMENTATION PLAN OF
THE GLOBAL FRAMEWORK
FOR CLIMATE SERVICES
(GFCS)**

DRAFT

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Executive Summary

The Global Framework for Climate Services – Improving Society’s Resilience to Climate-Related Hazards

Society’s challenge

Living with, and adapting to, climate variability and change is an everyday reality. Society has always had to deal with climate variability, including extreme weather and climate events, but the assumption that past climatic and socio-economic conditions are indicative of current and future conditions is now not necessarily valid. The combined effects of climate change and of increasing vulnerability and exposure to hazardous conditions due to migration, infrastructural development and changing land use present unprecedented challenges to society.

There is a growing need to improve our understanding of climate, climate predictions and our use of climate information to serve society’s needs better. Many countries are attempting to address these challenges by developing climate service capabilities. A climate service is considered here to be the provision of climate information in such a way as to assist decision-making by individuals and organisations. The service component involves appropriate engagement, an effective access mechanism and responsiveness to user-needs.

Effective climate services will facilitate climate-smart decisions that will reduce the impact of climate-related disasters, improve food security and health outcome, and enhance water resource management, for example.

Although many of the foundational capabilities and infrastructure for climate services already exist or are being established, coordination of the numerous programmes and institutes that have addressed individual aspects of climate service is generally weak. These components often operate in isolation and with varying degrees of success.

Five key challenges have been identified through widespread consultation both at and subsequent to the World Climate Conference-3 in 2009. These challenges are as follows:

- Access to climate services needs to be established and/or improved in all countries.
- The capacity to deal with climate-related risks is lacking in many countries.
- The availability and quality of climate data are inadequate in many parts of the globe.
- Users and providers need to interact better.
- The quality of climate services needs improvement to match user requirements better.

A *Global Framework for Climate Services* (hereafter called the Framework) will strengthen and coordinate existing initiatives will and develop new infrastructure where needed in order to meet these challenges.

The Goals and Benefits of a Global Framework for Climate Services

The **vision** of the Framework is to enable society to manage better the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to climate-related hazards. This will be done through developing and incorporating science-based climate information and prediction into planning, policy and practice. The Framework is intended to be long-lived, and the current Implementation Plan is only a first step at achieving this long-term vision.

The Framework has five overarching **goals**:

1. Reducing the vulnerability of society to climate-related hazards through better provision of climate information;
2. Advancing the key global development goals through better provision of climate information;
3. Mainstreaming the use of climate information in decision-making;
4. Strengthening the engagement of providers and users of climate services;
5. Maximising the utility of existing climate service infrastructure.

The Framework's long-term high-level outcomes and benefits are that user communities make climate-smart decisions and that climate information is disseminated effectively and in a manner that lends itself more easily to practical action. While long-term, these outcomes need to be tackled at an early stage in order to demonstrate the usefulness of the Framework to decision makers, providers and potential funders. Effective development and use of climate services will be of great value for decision-making in many economic and social sectors, value that has not yet been properly assessed by providers or users.

The Framework includes the following eight **Principles** for guiding successful achievement of its over-arching goals:

1. All countries will benefit, but priority shall go to building the capacity of developing countries vulnerable to the impacts of climate change and variability.
2. The primary goal will be to ensure greater availability of, access to and use of enhanced climate services for all countries.
3. Activities will address three geographic domains: global, regional and national.
4. Operational climate services will be the core element.
5. Climate information is primarily an international public good provided by governments, which will have a central role in its management.
6. Promote the free and open exchange of climate-relevant data, tools and scientifically based methods while respecting national and international policies.
7. The role of the Framework will be to facilitate and strengthen, not to duplicate.
8. The Framework will be built through user-provider partnerships that include all stakeholders.

The term "climate-relevant data" in Principle 6 highlights the point that many climate services need socio-economic and environmental data in addition to climate data. However, the principle of free and open exchange of climate-relevant data needs to respect national and international policies. For example, some data may need to be

restricted in light of national interests if it compromises national security, safety of citizens or national competitiveness. In such cases national policy may enable access to these data by climate service providers within a country's national borders.

Current Shortcomings

There have been major advances in our understanding of climate, its variations and related impacts. This, combined with investments made by governments in climate infrastructure over the years, has given us an impressive body of knowledge and systems upon which the Framework can build.

The quality, coverage and accessibility of climate-related data and the research, modelling and prediction of climate and its impacts are all steadily improving. However much more needs to be done, particularly to take account of and meet the needs of users and to develop services to meet those needs. The situation varies widely across the globe – some countries have access to well-developed services while others have very little or even none. In some cases information *is* available but is not known to or accessed by users. Developing countries are particularly likely to suffer from shortcomings in capacity and their needs should be given a higher priority.

There is scope for developing the capacity of users and professionals further and for better monitoring and evaluation of the use and effectiveness of climate services in decision-making. The user-driven focus of the Framework requires a much higher level of involvement of users in all aspects of climate service production, delivery and use. This area is generally under-developed in the climate services field but there are good examples from other disciplines that can provide useful lessons.

The Structure of the Global Framework for Climate Services

The Framework will be built upon the following five components, or pillars:

- *User Interface Platform*: a structured means for users, climate researchers and climate information providers to interact at all levels;
- *Climate Services Information System*: the mechanism through which information about climate (past, present and future) will be routinely collected, stored and processed to generate products and services that inform often complex decision-making across a wide range of climate-sensitive activities and enterprises;
- *Observations and Monitoring*: to ensure that climate observations and other data necessary to meet the needs of end users are collected, managed and disseminated and are supported by relevant metadata;
- *Research, Modelling and Prediction*: to foster research towards continually improving the scientific quality of climate information, providing an evidence base for the impacts of climate change and variability and for the cost-effectiveness of using climate information;
- *Capacity Development*: to address the particular capacity development requirements identified in the other pillars and, more broadly, the basic requirements for enabling any Framework-related activities to occur.

The User Interface Platform is the most novel component and reflects the fact that the involvement of users in helping to establish the needs, develop appropriate products,

identify capacity development requirements and influence the direction of observational investments and research efforts is crucial to achieving the Framework's goals.

The Framework will support and promote effective collaboration with global, regional and national stakeholders and efforts. At the global level the Framework will focus on defining the global goals, needs and large-scale activities required for successfully implementing the Framework. At the regional level the Framework will cooperate with multilateral efforts to address regional needs, for example through knowledge and data exchange, infrastructure development, research and training and by providing services regionally to meet requirements. At the national level the Framework will be developed and coordinated by each national government and key national organisations to ensure that all participants can express their needs and requirements for successfully implementing climate services that serve the population of the country.

What is Going to be Done?

In the initial stages, at least during the first two years, the Framework will prioritise developing and delivering services in four priority areas that address issues basic to the human condition and which present the most immediate opportunities for bringing benefits to human safety and well-being. These priority areas are Agriculture and Food Security; Disaster Risk Reduction; Health; and Water Resources. As the Framework evolves, the needs of users in other sectors will be addressed. The Framework will also give priority to building the capacities of climate-vulnerable developing countries. This does not mean that the needs of developed countries will be ignored, since capacity development applies to all.

The Framework's priority areas are closely aligned to the needs and goals addressed by the Millennium Development Goals, the Hyogo Framework for Action and the United Nations Framework Convention on Climate Change. Within the priority areas, particular benefits resulting from successful implementation of the Framework can be identified. For the Agriculture and Food Security sector these benefits include greater use of improved and better coordinated climate services, including seasonal forecasts, resulting in greater food production and reduced sensitivity to climate hazards. For Disaster Risk Reduction greater use of climate services will, among other benefits, lead to better asset protection and improved planning of responses to climate-related disasters. In the Health area greater understanding of the linkages of diseases to climate factors will result as well as better planning of disease control. Water resource management will benefit from improved infrastructure planning and better allocation of water resources.

Partnerships involving stakeholders at global, regional and national levels will be essential to the Framework's success. The Framework will need to ensure strong engagement from United Nations Agencies, other international organizations, existing climate service-related programmes, users, providers, donors, governments, private sector organizations and National Meteorological and Hydrological Services, many of whom have a strong weather service remit but not a strong one for climate service.

Recognising the principle that the Framework should build upon existing initiatives and not duplicate, there are significant opportunities for synergy with existing programmes and activities within the partner agencies and other bodies such as NGOs and the private sector.

The Framework will be implemented by coordinating and promoting activities and projects that help to achieve its overall goals. Many of these activities will continue efforts already being made across the globe by many countries but will now fit these efforts into a coherent framework with common goals.

Activities and Projects

The Implementation Plan identifies a series of high priority projects, formulated through a consultative process, that will address the priority areas and make significant progress toward the Framework's goals. Undertaking these projects will demonstrate the value of the Framework to providers, users and donors and ensure their sustained commitment, while delivering significant benefits to society.

Key deliverables over the initial two years are implementing the necessary governance, management and reporting frameworks; implementing the initial projects; developing regional and national capabilities; and engaging user communities.

Over the first six years the Framework aims to facilitate access to improved climate services worldwide in the initial priority areas and initiate activities in additional areas. After ten years the Framework aims to facilitate access to improved climate services worldwide and across all climate-sensitive sectors.

The first projects within the initial priority areas will be selected using guidelines aligned with the Principles and will address identified gaps. They will also contribute to developing one or more national or regional capacities, enhancing access to observations or building research capacity. The general approach will be to work with existing entities, build upon activities already underway, identify and engage with key organisations. An important outcome of these initial projects will be to learn lessons from them in order to move steadily towards sustainable and valued services.

The Framework will need a suitable governance structure to support its work in a sustained manner, to implement the above activities successfully and ultimately to meet the needs of users. This governance structure will enable high level representation of governments while bringing experts in appropriate fields and sectors into its substructure. An Intergovernmental Board is proposed to oversee implementation and a Framework Secretariat will provide administrative support. The Board and Secretariat would oversee the Framework's activities, including the initial projects, but this should not preclude participants from designing and implementing other activities and projects that fill gaps and address the Framework's priorities.

To promote the Framework and to inform stakeholders of its activities, an effective communications strategy will be put in place. Publicising early success stories will be a particular focus of this strategy.

While continuing investments in the various elements of climate services will be the largest component of the resources committed to the Framework by far, additional investment will be required to help developing countries. Targeting sources of funding outside national budget processes will be required. Such sources include Development Banks, Climate Funds (such as the Adaptation Fund, Climate Investment Funds, Green

Climate Fund and the Global Environment Facility), United Nations agencies, Overseas Development Assistance, regional economic groupings, national programmes and the private sector. Obtaining recognition from governments that climate services have considerable value and deserve support will be part of the challenge. In developed countries awareness of the value of climate services for economic development will need to be raised so as to encourage further investment in national facilities and also to demonstrate that investment in global services has value at the national level.

Conclusion

The Global Framework for Climate Services aims to enable society to manage the risks and opportunities arising from climate variability and change better, especially for those who are most vulnerable to such risks.

The Framework will have a strong emphasis on user involvement and capacity development, and the engagement of all partners in this concerted effort is designed to maximise benefits for all users. Though the initial focus will be on the four priority sectors, all climate-sensitive sectors stand to benefit in the long run.

The initial high priority projects will give impetus to the Framework. Their success will make significant progress towards the Framework's goals and build its credibility.

Providing climate services is not new, but the Framework represents a major, concerted, coordinated global effort to improve the well-being of all the parts of society vulnerable to climate variability and climate change. There are already mechanisms and institutions that provide climate services in a less coordinated way, as well as other activities and development plans such as the Millennium Development Goals and the United Nations Framework Convention on Climate Change that address climate issues. The Global Framework for Climate Services will be aligned with such activities, will benefit from them and vice versa, but will go beyond them by creating the structures needed to deliver needs-driven climate services across the globe.

1. INTRODUCTION

Living with and adapting to climate variability and change is an everyday reality. Society has always had to deal with climate variability, including extreme weather and climate events, but the assumption that past climatic and socio-economic conditions are indicative of current conditions is now not necessarily valid. The combined effects of climate change and of increasing vulnerability and exposure to hazardous conditions due to migration, infrastructural development and changing land use present unprecedented challenges to society.

Many countries are attempting to address these challenges by developing climate services (Box 1). To be useful, these services should consist of:

- *Products* – identifying, generating and making available a set of user-relevant and user-friendly products concerning climate variability and change that include information about the impact of these phenomena on society;
- *Support* – providing assistance in interpreting those products and, in collaboration with relevant stakeholders, helping identify a sensible set of decision options; and
- *Feedback* – on-going communication between users and providers so that ways of improving products and support can be identified continually.

Effective climate services will facilitate climate-smart decisions that will, for example, reduce the impact of climate-related disasters, improve food security and health outcomes, and enhance water resource management.

Although many of the foundational capabilities and infrastructures for climate services already exist or are being established, there is generally only weak coordination of the numerous programmes and institutions addressing individual aspects of climate service. These elements often operate in isolation and have had varying degrees of success. Widespread consultations with experts have identified the following key challenges (see Figure 1.1, which illustrates the timeline of consultations and reviews from experts and the broader community):

- *Accessibility*: many countries do not have climate services at all, and all countries have scope to improve access to such services.
- *Capacity*: many countries lack the capacity to anticipate and manage climate-related risks and opportunities.
- *Data*: the current availability and quality of climate observations and impact data are inadequate in much of the world.
- *Partnership*: mechanisms to enhance interactions between climate service users and providers are not always well developed, and user requirements are not always adequately understood and addressed.

- *Quality*: operational climate services are lagging behind advances in climate and applications sciences, and the spatial and temporal resolution of information is often insufficient for fulfilling user requirements.

This document outlines how the challenges can be overcome by implementing a *Global Framework for Climate Services* (hereafter referred to as the Framework) that strengthens and coordinates existing initiatives, while developing new infrastructure where lacking, particularly in the relatively poorly developed User Interface Platform (described below). This Framework will provide the basis for: evaluating the significant investments that have been made in all aspects of climate services; distilling lessons learned; identifying the most promising areas of, and approaches to, societal application; and identifying the necessary conditions for success. It will need to represent the entire world in order to ensure a comprehensive and progressive approach to managing climate risks.

Box 1: Some basic definitions, as used in this Implementation Plan

Climate data: Historical and real-time climate observations along with direct model outputs covering historical and future periods. Information about how these observations and model outputs were generated (“metadata”) should accompany all climate data.

Climate product: A derived synthesis of climate data. A product combines climate data with climate knowledge to add value.

Climate information: Climate data, climate products and/or climate knowledge.

Climate service: Providing climate information in a way that assists decision making by individuals and organizations. A service requires appropriate engagement along with an effective access mechanism and must respond to user needs.

For additional definitions see the Glossary in the High-Level Taskforce Report.

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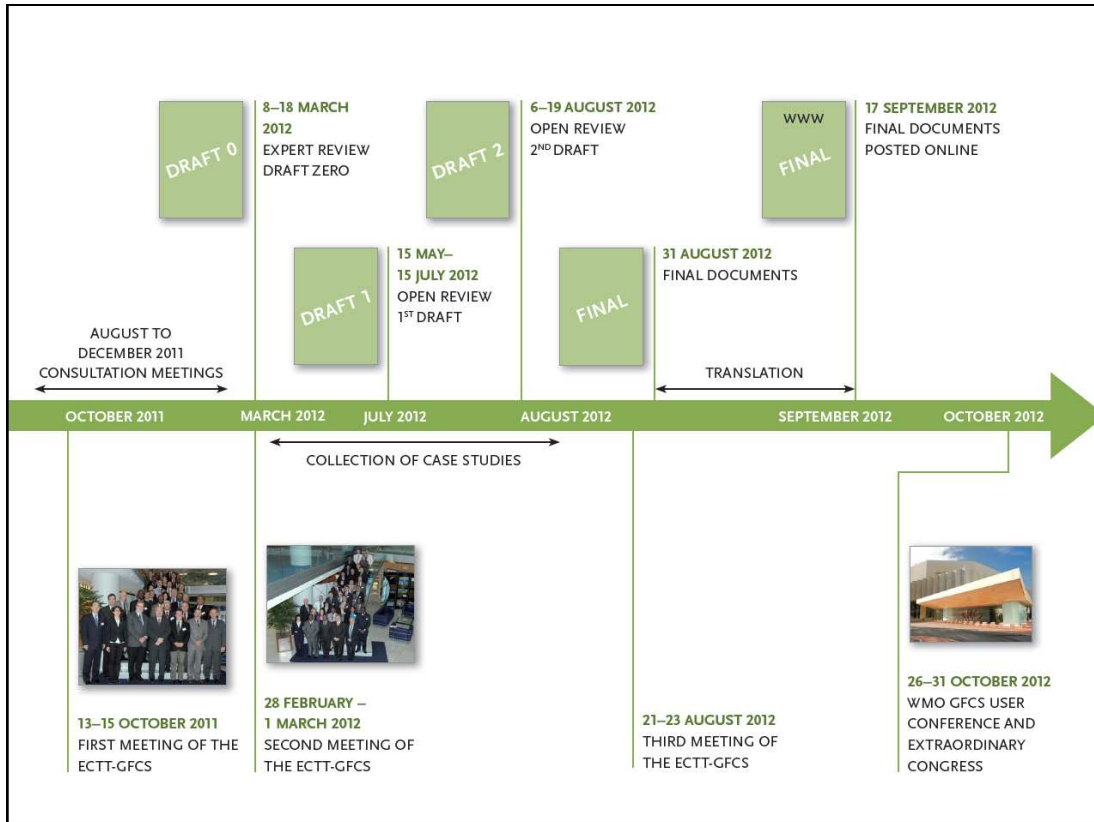


Figure 1.1: Process towards delivering the Implementation Plan at the Extraordinary World Meteorological Congress in October 2012.

The Framework is not a new entity mandated to provide climate services. It is an enabling mechanism whose value lies in coordinating, facilitating, and developing operational climate services where needed. It bridges the gap between climate service providers and users, ensuring that past and future investments and initiatives are exploited to the full. The Framework will initially focus on providing greater benefits in four priority areas: reducing disaster risks, increasing food security, improving health and promoting more effective water management. These areas are being focused on because they offer the most immediate opportunity to benefit decision making at all levels and to have a consequential impact on human safety and well-being. Benefits for other sectors such as energy may be identified and pursued as Framework implementation progresses.

While all countries stand to gain from participation in the Framework, support should be mobilized first of all to address the needs of the populations most vulnerable to climate-related hazards. Priority will be given to developing the capacity of vulnerable countries currently least able to provide climate services, including Least Developed Countries, Small Island Developing States and Landlocked Developing Countries.

1.1 Establishment of the Global Framework for Climate Services

The process of developing the Framework was set in motion by Heads of States and government ministers in 2009 at the World Climate Conference-3 (Figure 1.2), following which a High Level Taskforce developed the concept in a report published in February 2011. The development of this Implementation Plan is the next step towards making the Framework a reality.

This Plan provides a summary and prioritized list of activities that the international community has put forward in the past year. It was achieved through an inclusive process of consultation meetings across all functional components of the Framework, with more than 300 participating global experts and a collection of case studies from more than 60 nations (http://www.wmo.int/pages/gfcs/consultations_en.php). This collective knowledge was distilled into five Annexes, one for each of the functional components (“pillars”), plus four Exemplars, one for each priority area. The Annexes describe the needs that have to be met in the current global environment to achieve the goals set out in the Framework and describe priority activities that will deliver those benefits. The Exemplars gave an opportunity to lead agencies of the priority areas to develop their views on the necessary elements for delivering on the promises of the Framework.

The key needs and activities identified and described in each of these elements of the Implementation Plan provided the content for the current Implementation Plan.

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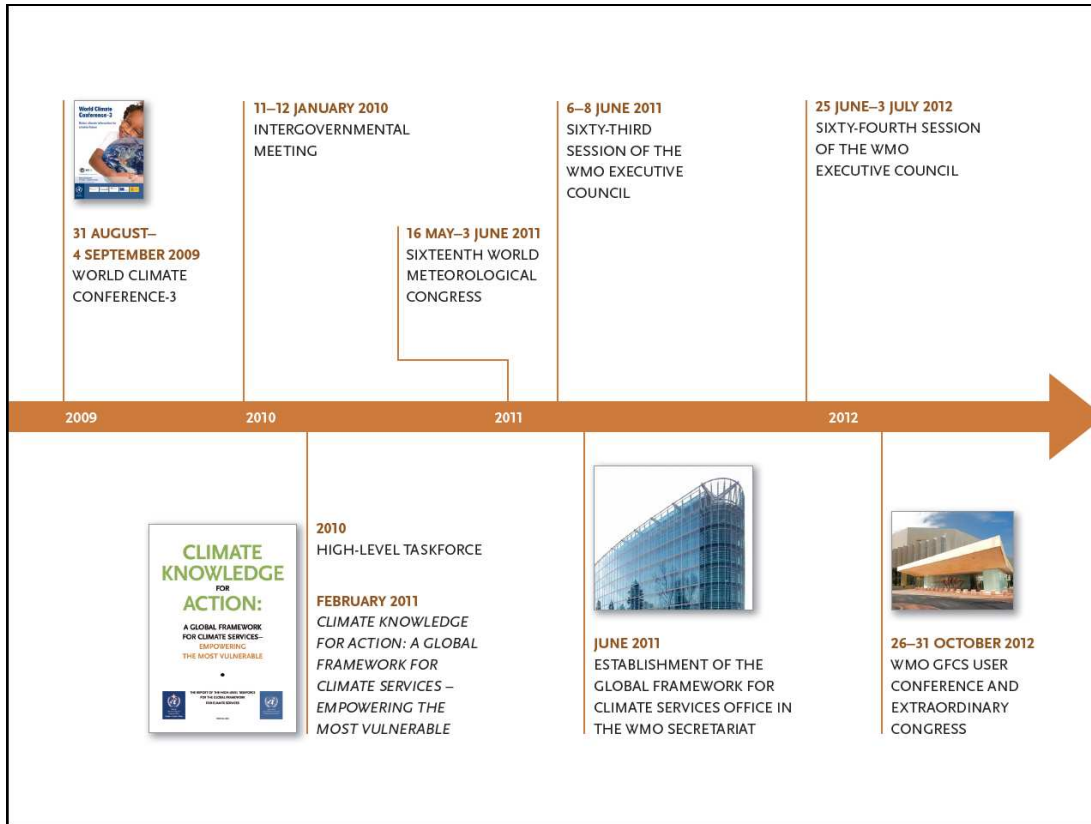


Figure 1.2: Historic evolution of the Global Framework for Climate Services

1.2 Vision and Goals of the Framework

The vision of the Global Framework for Climate Services is:
To enable society to manage better the risks and opportunities arising from climate variability and change, especially as they concern those who are most vulnerable to climate-related hazards.

The goals of the Framework in support of this vision are:

1. *Reducing the vulnerability of society to climate-related hazards through better provision of climate services;*
2. *Advancing the key global development goals through better provision of climate services;*
3. *Mainstreaming the use of climate information in decision making.* Promoting better uptake, understanding and awareness of the need for climate information and climate services; and demonstrating the value of the services in socio-economic, safety and sustainability terms;

4. *Strengthening the engagement of providers and users of climate services.* Building relationships between providers and users of climate services at both the technical and decision-making levels; and
5. *Maximising the utility of existing climate service infrastructure.* Improving coordination, and strengthening and building this infrastructure where needed.

The Framework will facilitate the societal benefits of climate services so that outputs become better assimilated by decision makers. Near-term (weeks to months), operational decisions are supported better using historical climate information and information about forecast variations in the climate. Longer-term decisions on adapting to and mitigating future climate change can also be strengthened by using projections of the impacts of climate change. In all cases, climate services can be used to ensure that investments are wisely made and used. Services based on high-quality climate information thus have a huge potential for enabling better-informed decisions that are of great value to society. Nevertheless, the value of climate services needs to be demonstrated, by important research that implementation of the Framework will promote.

Improving the scientific quality, accessibility and relevance of climate information to users is a fundamental element of the Framework. However, the Framework needs to go beyond the concept of service providers being simply suppliers of products and instead must fully collaborate with the users and embrace their goals. In addition, improved interaction between providers and users is not only essential for ensuring that climate information meets user-needs; it also provides a feedback mechanism for climate scientists, forecasters, and modellers that may be useful in improving products and tools.

The Framework presents an important opportunity to enhance well-being in all countries by contributing to development, disaster risk reduction and climate change adaptation and mitigation. None of this progress can be realized without continued development of capacities and capabilities globally, regionally and nationally.

Across all priority areas, core demands for climate services include planning, operations and impact assessment. Though there are many excellent examples of effective use of climate information, all too often these remain confined to one location or sector and are not supported by a widely available service, a gap that implementation of the Framework aims to fill.

1.3 Objectives of the Framework

Now is the time for implementing the Framework. The reasons and motivations for this are:

- Many socio-economic sectors are highly sensitive to weather and climate extremes. Decision-makers in these sectors are insufficiently equipped to make effective use of climate information in managing current and future climate risks as well as associated risks to ecosystems. Consequently, there is not only an urgent need for enhanced global cooperation in developing accurate and timely climate information; there is an equally urgent need for exchanging this information between the providers and users of climate services.
- Recent advances in science and technology offer the prospect of further improvements in the quality of climate information and prediction services. An effective two-way dialogue between providers and users on the range, timing, quality and content of climate products and services across all socio-economic sectors will help ensure that decisions relating to managing climate risks are well informed, more effective and better targeted.

Long-term high-level outcomes of the Framework, which need to be demonstrated from an early stage, are that:

- user communities are making climate-smart decisions; and that
- climate information is being disseminated effectively and in a manner that lends itself more easily to practical action than at present.

The Framework will be implemented through activities and projects that will be enabled by mobilizing the necessary resources, including funding. It sets targets within 2-, 6-, and 10-year timeframes to facilitate review at the World Meteorological Congress sessions (beginning with the 2015 Congress), reflecting the key role the Congress will play in governing the Framework. In the first two years the Framework implementers will focus on developing and delivering services to the four priority areas. The objectives of the Framework will evolve as its implementation matures and initial successes are realized, but after six years it is expected that improvements to climate services in these priority areas will be measurable and that activities in other areas will be initiated as new priorities emerge. After ten years there will be access to improved climate services throughout the world and across all climate-sensitive sectors.

1.4 The Principles for implementing the Framework

The High-Level Taskforce compiled a list of Principles and recommended that these be adhered to in the implementation the Framework. The 16th World Meteorological Congress also encouraged using the Principles as a guide for decision making in this implementation. The following Principles are based heavily on those recommendations:

Principle 1: All countries will benefit, but priority shall go to building the capacity of developing countries most vulnerable to the impacts of climate change and variability.

Principle 2: A primary goal of the Framework will be to ensure greater availability of, access to, and use of enhanced climate services for all countries.

The Framework is designed to serve the needs of all users, regardless of their geographic location, capabilities or capacities in society.

Principle 3: Activities will address three geographic domains: global, regional and national.

The Framework implementers will promote the accessibility of climate services by developing the international infrastructure needed. Nevertheless, most demonstration projects are likely to be implemented at the local level.

Principle 4: Operational climate services will be the core element of the Framework.

To ensure the application of a quality management framework, credentials and good practices for operational climate services should be defined and adhered to. Some of these principles are already in place but need to be developed further (see Principle 7).

Principle 5: Climate information is primarily an international public good provided by governments. Governments will therefore have a central role in its management under the Framework.

Climate information is largely funded from public resources, given that its costs are far outweighed by its benefits across a wide range of domains in which there is an important public interest. Governments need to play a central role in managing and governing the Framework because of the strength of this interest.

Principle 6: The Framework will promote free and open exchange of climate-relevant data, tools and scientifically based methods while respecting national and international policies.

Climate-relevant data include observational climate data (Box 1), plus socio-economic and environmental data that are useful for climate services aimed at the public good (Principle 5). Data collected for security and border monitoring purposes, for example, and other sensitive data are not addressed within the Framework. Facilitating the exchange of climate-relevant data that are in the public domain and promoting the availability of additional climate-relevant data together constitute an important enabling mechanism for developing enhanced climate services. However, data access may be restricted by national interests if such

access compromises national security, citizen safety or national competitiveness. In such cases, national policy may enable access to these data by climate service providers only within their national borders. It is understood that these data will not subsequently be disseminated beyond the scope of what national policies permit.

Principle 7: The role of the Framework will be to facilitate and strengthen, not to duplicate.

Considerable investments have already been made in developing many of the components of effective climate services. The Framework is intended not only to take full advantage of these investments but also to increase their effectiveness through strengthening and coordination.

Principle 8: The Framework will be implemented on the basis of user-provider partnerships that include all stakeholders.

Climate information users and providers will necessarily be engaged in designing climate services to ensure that these services are both usable and credible.

All eight Principles aim at promoting good practices in implementing operational climate services. Framework implementation will live up to these Principles by establishing standards, identifying priorities, developing capacity and advocating, along with facilitating and coordinating activities. Given the broad scope of this task the High-Level Taskforce has proposed a structured conceptualization of the Framework that is described in section 1.5.

1.5 The Functional Components, or Pillars, of the Framework

The structure for the Framework is based on five essential components, or pillars, that are needed to make producing and delivering effective climate services possible (Figure 1.3). The pillars are meant primarily as a conceptual model; in practice there is some overlapping of functions and responsibilities that will require careful coordination. The Annexes to this Implementation Plan discuss each pillar in further detail. For each of the four priority areas there is an additional document, or Exemplar, that describes the sector-specific implementation of the User Interface Platform in greater detail.

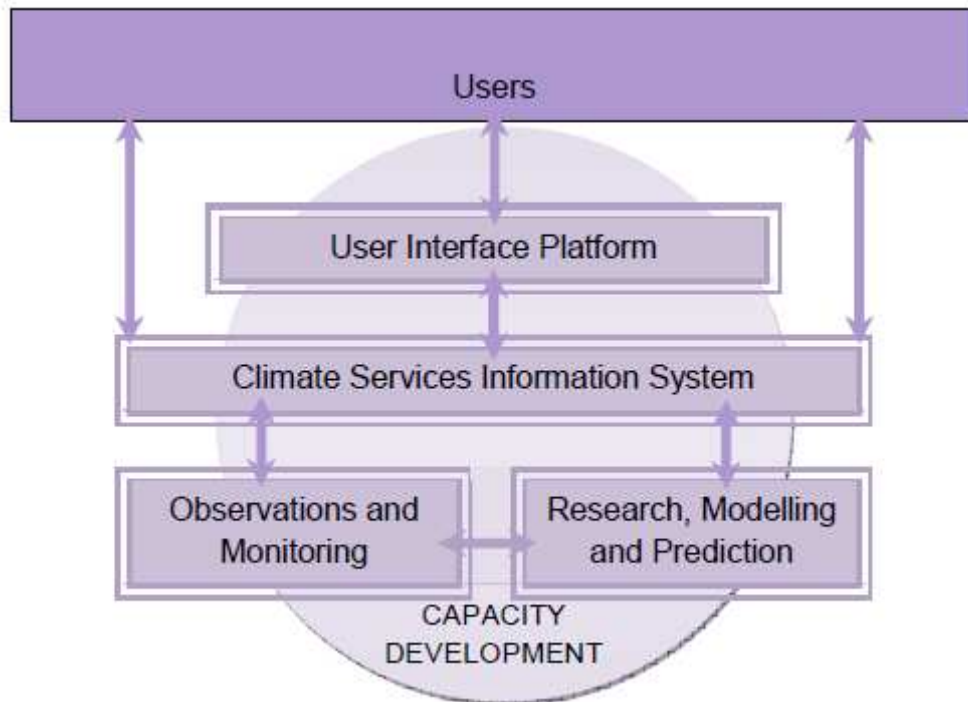


Figure 1.3: A schematic illustration of the five pillars of the Framework and their links to various user communities.

User Interface Platform

The User Interface Platform is the pillar of the Framework that provides a structured means for users, climate researchers and climate data and information providers to interact at all levels. The objective of the User Interface Platform is to promote effective decision making with respect to climate considerations by making sure that the right information, at the right time and in the right amount, is delivered, understood, and used. The UIP operates using a wide-range of methods designed to promote mutual understanding, including formally established committees, working groups, internship programmes, one-on-one discussion, workshops, conferences and inter-agency task teams. Communication, outreach and training approaches are equally wide-ranging. They include radio broadcasts, social media and public service announcements while using technologies such as map interfaces, portals and information servers. In many areas of this work there are opportunities to build upon dialogues already well-established or that are growing in effectiveness, such as the Regional Climate Outlook Forums, community liaison working groups in the disaster management community and national health working groups.

The proposed enhanced interaction between users and providers aims to reconcile the availability of credible climate information with the needs of users for information to

support their decision making. This mutual understanding can then frame an end-to-end climate service that may involve developing useful products. Developing such products may hinge upon further research or new observations, so by facilitating this mutual understanding the UIP will inform the priorities of each of the other pillars. For example, it can by highlight capacity requirements for delivering and supporting these products as a climate service. The Platform is not, therefore, a stand-alone entity; it functions instead as a liaison through which the other pillars of the Framework can generate and deliver what is needed for climate-sensitive decision making.

To ensure success, the User-Interface Platform aims to achieve the following:

- *Dialogue*: build dialogue between climate service users and those responsible for the observation, research and information system pillars of the Framework;
- *Outreach*: improve climate literacy in the user community through a range of public education initiatives and on-line training programmes;
- *Feedback*: identify optimal methods for obtaining feedback from user communities;
- *Monitoring and evaluation*: develop monitoring and evaluation measures of progress made in improving climate services according to agreements between users and providers.

Climate Services Information System

The Climate Services Information System is the principal mechanism through which information about climate (past, present and future) is routinely collected, stored and processed to generate products and services that inform decision-making processes, often complex, across a wide range of climate-sensitive activities and enterprises. It is the means by which research outputs and technological developments are transformed into improved operational climate information.

The Climate Services Information System comprises a physical infrastructure of institutions, computer capabilities, tools and operational practices. Together with professional human resources it develops, generates and distributes a wide range of climate information products and services usable at the global, regional and national scales. It needs to be operated within a policy environment that promotes the unrestricted flow of climate data, while respecting national and international data policies.

In practice, the many existing centres that will form the Climate Services Information System infrastructure already carry out these functions to varying degrees, but there is need to expand, coordinate and standardize operations and products. The infrastructure needs to be strengthened to support and develop national climate information providers in countries currently capable of providing only the most basic climate services.

Observations and Monitoring

The Observations and Monitoring pillar helps ensure that the climate observations necessary to meet the needs of end users are made, managed and disseminated, supported by relevant metadata. High-quality historical and real-time observations and data are required not only across the entire climate system but also relevant biological, environmental, and socio-economic variables so that the impacts of climate variability and change can be evaluated and addressed. Monitoring products such as extreme value statistics derived from high-quality climate observations are of prime importance to planning decisions, for instance regarding reducing disaster risk by developing appropriately resilient infrastructure.

Existing capabilities for climate observation and data exchange provide a strong basis for improving climate services globally. In this respect, the Framework will benefit from existing surface-based and satellite-based observing systems that already provide a wealth of data, including the Global Climate Observing System and the Global Earth Observation System of Systems. The specific role of the pillar is to re-focus and strengthen such systems to support climate service operations. It addresses important gaps in climate observations, including addressing the weaknesses of the observation networks in the most vulnerable, risk-prone and remote areas of least developed and developing countries. It also addresses difficulties in transforming research-based observations into operations, promotes the integration of remotely-sensed and *in situ* observations, and promotes the free and open exchange of climate-relevant observational data while respecting property rights and national and international policies. It also promotes the interoperability of biological, environmental and socio-economic data with climate data.

Research, Modelling and Prediction

The Research, Modelling and Prediction pillar fosters research towards continually improving the scientific quality of climate information, providing an evidence base for determining the impacts of climate change and variability and for evaluating the cost-effectiveness of using climate information. It supports the development and improvement of tools and methods that will facilitate the transition of research to operational climate service provision and engender practical applications of climate information. High-quality, reliable observation data and targeted dynamical model outputs will be developed to support the activities of the other pillars.

Research strategies and programmes are well-established in the field of climate and in some aspects of the field of climate impacts. Examples include the World Climate Research Programme and the Special Programme for Research and Training in Tropical Diseases. The Research, Modelling and Prediction component will assess and promote the needs of climate services development and implementation within such research agendas.

Capacity Development

The Framework is proposed as a holistic approach to enable countries, companies and individuals to benefit from the global investments that have already been made and will continue to be made in the other four pillars. Capacity Development approaches and actions identified in this implementation plan address the requirements identified in the other pillars as well as, more broadly, the basic requirements for enabling any Framework-related activities to occur sustainably.

The main providers of climate services in many countries lack the necessary mandate to interact with users and the capacity to provide the full range of climate services needed in an efficient, accurate and timely manner. Similarly, many users of climate services require capacity development for them to utilize existing data, products and information well and to be involved in the process of developing new products and services.

This lack of capacity is found most acutely in many Least Developed Countries, Small Island Developing States and Landlocked Developing Countries where the need for climate services is greatest. Such countries often have: unstructured mechanisms to enable users to interact with the national climate service providers; inadequate observation networks for climate information; lack of expertise in generating climate products and outlooks; insufficient facilities for easy dissemination of information to the various user communities in the required format; and lack of capacity to undertake targeted research and receive feedback from users to improve the quality of the products. The Framework's implementers will have to determine the presence or absence of these underlying structures in specific countries and regions while Framework-related projects are being planned and implemented.

The approach to Capacity Development under the Framework is to help strengthen existing capabilities that are needed to enable all countries to manage climate risk effectively. Areas included are governance, management, human resources development, education and training, leadership, partnership creation, science communication, service delivery, resource mobilization and infrastructure. Some of the foundational capabilities and infrastructure already exist in these areas or are being established in the neediest countries, but they require coordination and a more intense focus on user needs.

1.6 Outline of the Implementation Plan

This Implementation Plan lays out a roadmap and methodology that will help realize the benefits of enhanced climate services. It also indicates the necessary conditions for successful implementation, identifies stakeholders and their respective roles, lists priorities and describes some initial activities while addressing the issues of monitoring, evaluation and risk management. It also proposes options on governance, communication strategies and approaches to resource mobilization. For the Framework

to be successful it will require more than just proactive collaboration by interested parties: additional resource mobilization will be important at all levels. The beneficiary countries, with guidance from the Framework's Secretariat and other bodies, will need to target national, regional and global stakeholders that are potential sources of support. This Implementation Plan attempts to provide answers to many of the questions that these stakeholders will ask, particularly in terms of long term sustainability.

2. BENEFITS FROM THE GLOBAL FRAMEWORK FOR CLIMATE SERVICES

2.1 Potential of the Framework in meeting the needs of climate-informed decision making

Climate services involve generating and making available to users a set of historical, real-time and prospective information products concerning climate variability and change along with information about their impacts. These products are accompanied by assistance in their interpretation and in identifying a sensible set of decision options while enabling mutual feedback so that ways of improving services can be identified on an on-going basis.

When making the decision to establish the Global Framework for Climate Services, the World Climate Conference-3 considered the costs and benefits of climate information and climate services to be one of the decision's primary motivating factors. Presentations made to the Conference included the opinion: "the economic and social benefits of climate information are becoming increasingly clear: potential costs of mitigation and adaptation strategies, as well as the cost of inaction, can be assessed more accurately, and potential biases in decision making can be revealed more decisively. However, to do so requires careful linkages of climate and socioeconomic data and models at local scales – an endeavour for fruitful collaboration of climate scientists and social scientists." (Ruth, M; Economic and Social Benefits of Climate Information: Assessing the Cost of Inaction; World Climate Conference-3). The Conference was informed of one specific example where it was claimed that the "value of 'modest' and 'high' skill ENSO predictions is \$240 m and \$266 m respectively per year (1995 values)". (Solow, A R *et al.* (1999), in *Improving El Nino Forecasting: The Potential Economic Benefits*, R F Weiher, NOAA, Washington DC, quoted by Gunasekera, D: Centre for Complex Systems Science, CSIRO Marine and Atmospheric Research, Australia).

The Stern Report on the Economics of Climate Change (2005), commissioned by the Government of the United Kingdom, concluded that:

"The benefits of strong, early action on climate change outweigh the costs."

While much of the action envisaged by the Stern Report is related to mitigation of climate change by controlling greenhouse gas emissions, the statement is relevant to

climate services also as the Report goes on to state that “high-quality climate information and tools for risk management will help to drive efficient markets. Improved regional climate predictions will be critical, particularly for rainfall and storm patterns.”

There are many sectors that are sensitive to climate variability and climate change. They include agriculture and food security; cultural heritage protection; disaster risk reduction; ecosystems and the environment; energy; forestry; health; megacities; oceans and coasts, tourism; transport; and water resources.

Some general examples of the uses of climate services are:

- National socio-economic planning and development (including poverty reduction strategies) as well as natural capital accounting can be informed by climate information on climate variability and climate change.
- Major infrastructural projects influencing the lives and economic well-being of citizens have to be implemented using detailed climate information to ensure that a safe and sustainable outcome is achieved. Examples of these are new water reservoirs as well as plans and infrastructure for expanding settlements. Sectorial economic policy that targets climate-sensitive communities and industries must also take detailed climate information into account.
- Climate information is used to manage drought risk by designing new and rehabilitated irrigation canals and water storages. These canals provide communities with a buffer against heavy rainfall events by collecting excess water and against droughts by using the stored water resources.
- Climate information is used to manage cropping, livestock and fisheries activities at the local level on a regular basis. It is also needed for making decisions about food security at the national and regional levels. In agriculture and food security, climate information products for decision making include agro-meteorological bulletins, alerts, monthly and seasonal climate forecast bulletins, crop prospects and early warning of impending food crisis.
- The area of risk management in climate-sensitive industries is one where climate information plays a key role. Insurance coverage helps deal with the more extreme climatic risks (and associated weather extremes) that individual enterprises cannot manage alone, and insurance requires a solid underpinning of weather and climate services in order to estimate reliably the risks involved, particularly the magnitudes, of rare extreme conditions that result in the greatest damage.
- The energy sector uses climate predictions to estimate demand and to make provision for responding to that demand. Climate information is also used in estimating wind and solar energy potential to meet future energy needs.
- In several regions of the world, countries cooperate to produce a consensus seasonal climate outlook through periodic Regional Climate Outlook Forums. These forums bring together climate experts and sector representatives from agriculture, food security and health and water management, among others, to review climate prediction information, develop consensus-based outlooks and raise awareness of

emerging or potential regional impacts. In this way they help ensure consistency in access to, and interpretation of, climate information for groups of countries having similar climatological and socio-economic characteristics.

- Researchers in many fields, in their quest to understand the functioning of natural systems, make use of diverse and extensive climate information alongside other types of data. Ecologists, social scientists and sector applications scientists, for example, often use detailed site-specific climate information for particular communities or industries.
- Tracking of present climate in comparison with the climate at the same time last year, joined with long term averages, helps provide initial state information as a context for weather and seasonal forecasts, thus better preparing managers of climate-sensitive activities to consider options for managing immediate and seasonal risks and opportunities.

As mentioned in Chapter 1, four priority areas were chosen for early attention under the Framework. These areas are Agriculture and Food Security (including fisheries and aquaculture), Disaster Risk Reduction, Health, and Water. While acknowledging that all sectors can benefit from the improved climate services envisaged within the Framework, it was recognized that it would not be possible to cover all areas at once. The four areas selected present the most immediate opportunities to benefit decision making at all levels. Among the people most vulnerable to climate change and variability are those whose livelihoods are heavily dependent on rain-fed agriculture and seasonal water resources. These are people who are often exposed to infectious vector-borne, water-borne and airborne diseases (and to similar impacts on animal health) as well as to local air and water pollution sources. At the same time they have minimal access to information and health services and are often untouched by public health regulations. These are also people who may profit most from targeted climate services in the four priority areas because these services will reduce their vulnerability.

Moreover, a number of major intergovernmental and international policy efforts in these four areas are significantly affected by climate. Climate services in the four priority areas are most closely linked to the needs and goals addressed by the Millennium Development Goals (and Sustainable Development Goals in the future), the United Nations Framework Convention on Climate Change, the Hyogo Framework for Action, (and any successor framework) and other conventions. For example, the Framework's focus on disasters will support the Hyogo Framework for Action directly by enhancing the disaster risk reduction and risk management methods necessary for adapting to climate change.

The natural evolution of Framework-related activity will see other sectors come into focus. As an example of a sector that is likely to be considered as one of the next priority areas, the energy sector is recognized for its importance in sustainability and in climate adaptation and mitigation. This sector is particularly sensitive to weather and climate and is therefore an experienced user of climate information. The Intergovernmental Panel on

Climate Change Fourth Assessment Report suggests that climate change will affect both energy supply and demand, which will inevitably ramp up the sector's sensitivity to climate and its attention to the data and tools needed to manage climate variations better. In fact, 2012 has been declared the International Year of Sustainable Energy for All, recognizing that "... access to modern affordable energy services in developing countries is essential for the achievement of ... the Millennium Development Goals and sustainable development."

The effectiveness and benefits of climate services depend upon how they are used. A practical picture of the benefits that each priority area should expect from participating in the Framework is shown in Section 2.2. Though not definitive or exhaustive, these examples were gathered through inter-agency consultations and illustrate some potential outcomes from the Framework regarding climate-informed decision making.

A process to enable users and climate service providers to identify the potential benefits of climate services better will be an on-going part of Framework implementation. Realizing the potential benefits to the initial priority sectors and to other sectors in due course will be a measure of the Framework's success.

2.2 Benefits to Agriculture and Food Security

In the priority area of agriculture and food security (including fisheries), decision making can benefit greatly from climate services. Involving millions of individuals, from farmers, managers, agricultural industries and local authorities to national policymakers, climate services can address most aspects of the agricultural and food security process – from production, stocks, markets, transportation and planning, to food aid supply and delivery.

Available, accessible, and useful information can help agricultural decision makers improve their understanding of the mechanisms of climate impact on agricultural development and food systems and estimate populations at risk from food insecurity (risk mapping). It can help them understand the impacts of climate change on the well-being of livestock, on crop phenology and allow them to calculate better the necessary timing of interventions and investments. It can help them monitor and predict year-to-year variations in productivity, enabling early warning systems for agriculture and food security, as well as identifying longer-term trends for potential impacts.

Providing climate information and products in a timely manner and using them appropriately in different agro-ecosystems may also save lives in famine-plagued areas. Use of climate services by the agricultural community can enhance water and nutrient management and thereby help protect the environment. Climate information helps livestock-based agricultural enterprises and herders make decisions about moving livestock to alternate grazing areas and in deciding on stock numbers as part of their risk management efforts. Similarly, climate information provides advance details for estimating bush-fire risks based on temperature, humidity and wind scenarios, thus

assisting in protecting the livelihood assets of indigenous populations and of forest-dependent communities. The agricultural community relies on appropriate and timely environmental, climate and phenological information on relevant space and time scales to make informed decisions. There is an opportunity for integrating climate services into practices and policies for agricultural development and food security decisions.

Agriculture and Food Security

Benefits of successful implementation of the Global Framework

- A wide array of agricultural decision makers including government policy makers, agricultural extension services, farmers, research and university institutions, agribusiness and the crop insurance industry and farm management groups can make better-informed decisions by using climate services. As a result, the sector and society will benefit from improved resilience to climate extremes and from increased and more reliable agricultural productivity.
- Improved use of climate information to keep the food supply/demand situation under continuous review and to issue outlooks on crop prospects, the food situation and to give early warning of impending food crises
- Improved use of more reliable seasonal climate forecasts reduces the sensitivity of rural communities and industries to failed crops and misguided logistics. Use of more understandable language in probabilistic forecasts for farmers enhances their yields.
- Key climate variables for agricultural decision making (rainfall, soil moisture, temperature, solar radiation, humidity and wind speed), supplemented with optimal agricultural decision options, are more easily available and understood by agricultural and rural communities improving yields and livelihoods.
- Needs that were met in an *ad hoc* fashion by a growing pool of sources of data products, services and information are met in a more routine and coordinated manner, avoiding duplication of efforts and reducing costs.
- Improved decisions can be communicated through sources agriculture users already know and trust (farmer associations, Non-Governmental Organizations, village leaders).

2.3 Benefits to Disaster Risk Reduction

Climate Services can be useful in support of disaster risk management that, according to the Hyogo Framework for Action, includes risk reduction as a national and local priority.

This management also includes identifying and monitoring risk, building a culture of safety and resilience, reducing the underlying risk factors and strengthening disaster preparedness. Effective disaster risk management is based on quantifying and understanding risks associated with natural hazards. Climate information is critical for analysing hazard patterns and trends. This information may be complemented by other inputs (such as socio-economic data and analysis) for vulnerability assessment. With this knowledge, governments can manage risk through early warning systems and preparedness, sectorial planning, insurance and financing mechanisms. Collection of loss data (by appropriate agencies) for cost-benefit analysis is needed to measure the added value of early warning systems, for example, and thereby provide economic justification for investment.

Climate services can assist in creating assets for building resilience as well as for assisting in proper planning and decision making on matters such as siting critical infrastructure (hospitals and bridges, for example), to which access must be maintained in a disaster; locating industries that might contaminate soil and water supplies in a disaster; protecting vulnerable people such as school children and slum dwellers as well as protecting fragile ecosystems like mountain slopes.

Disaster Risk Reduction

Benefits of successful implementation of the Global Framework

- Disseminating warnings of approaching middle- and long-range hazards (in addition to operational short-range weather forecasts) enables the protection of lives and livelihoods through appropriate preparedness and enhanced lead-time to respond.
- Land-use planning, informed by climate information to reduce risk, enables vulnerable populations and ecosystems to be protected by locating critical infrastructure carefully, by distancing industries that could contaminate soil and water supplies in a disaster from people and fragile ecosystems, and by impeding the development of settlements in high-risk areas such as unstable mountain slopes and flood-prone land.
- Livelihoods are made more resilient to disaster by planning based on short-, middle- and long-range hazard forecasts. This planning enables income diversification through non-weather-dependent seasonal employment and asset protection from extreme weather and climate damage by cultivating drought-resistant crops.
- Data and observations on extreme weather events and patterns as well as on climate events (e.g. frequency and distribution of drought, floods, heat waves, extreme winds, etc.) are available in sufficient quality and quantity to support

disaster risk financing (including weather index-based insurance), allowing more users in climate-sensitive sectors (e.g. agriculture) to achieve increased livelihood security.

- Climate forecasts and projections are of value in protecting or restoring ecosystems that mitigate hazards, such as forests on slopes and mangroves in coastal areas.

2.4 Benefits to Health

In the priority area of Health, climate-informed health systems and services not only can save lives but can also function more efficiently with improved predictions and better preparedness concerning climate-related health risks. Climate information can also enable better resource allocation to protect the most vulnerable populations and health systems.

There is an opportunity to improve health protection by increasing the climate resilience of formal health sectors as well as of health-determining sectors such as water resources, agriculture and disaster risk management. To take advantage of this opportunity, the urgent need for accelerated enhancement of climate services and their application to support development must be addressed as a necessary step in adapting to climate change.

The Framework also brings with it a tremendous opportunity to improve health operations and risk monitoring while promoting a more integrated approach to sustainable development. Climate conditions have an impact on some of the greatest burdens of infectious disease, particularly among poorer populations. These burdens are especially associated with diarrhoea, malaria and other vector-borne and water-borne diseases. Moreover, the indirect impacts of climate are responsible for the majority of climate-related illnesses. This is because changes in temperature and precipitation influence the environmental conditions that determine the geographic range and incidence of vector-, rodent-, water- and food-borne diseases, having an effect on air pollution and aeroallergen-related diseases as well. More fundamentally, climatic conditions affect natural and managed ecosystem services that underpin public health, including agricultural production and the availability of fresh water. These determine food security, potable water and also have an impact on shelter. The health community, working with climate scientists and climate service providers under the Framework, could organize itself to use climate information systematically in its operations.

Health

Benefits of successful implementation of the Global Framework

- Health sector partners are supported with appropriate climate information and services to help them achieve their priorities in addressing climate risks to

health, such as those established by the World Health Assembly and United Nations Framework Convention on Climate Change.

- A greater understanding is developed of the current patterns and burdens of many diseases as well as of their linkages to the environment and climate, an understanding that can be integrated into Early Warning Systems for improved preparedness.
- High quality data from different sectors (trans-disciplinary data sets) that can be applied to complex environment-health issues are available in the appropriate format and scale and in a manner that resolves privacy and ownership issues, making an overall contribution to public health.
- Enhanced capacity and awareness, coupled with widely disseminated and understood seasonal forecasts, improve the health sectors' ability to plan more effectively when expected climate and weather conditions create health risks.
- Partnerships are forged for effective collaboration and joint action in support of existing health priorities, goals and technical agendas such as the Millennium Development Goals, the Hyogo Framework for Action and the International Health Regulations.
- Climate information is developed that is both applicable and commonly used to improve the performance and management of health risk assessment, integrated epidemiological surveillance and environmental monitoring, health emergency risk management and health service delivery.

2.5 Benefits to the Water Sector

The Water Sector is very climate-sensitive, with strong links to other priority areas. Protecting and managing water using climate information is essential to improving food security in irrigated and rain-fed areas, reducing the risk of water borne disease and improving sanitation. Since the extremes of water availability (floods and droughts) are major contributors to disasters, with their associated deaths and damages, water is linked to disaster risk reduction as well. Water security is a global concern that is exacerbated by water's vulnerability to climate change. Water resource management is a day-to-day and a year-to-year activity as well as a long term strategic planning issue. Thus there are considerable benefits to be obtained through climate services in relation to the water sector on all time scales.

Water

Benefits of successful implementation of the Global Framework

- Climate information services are used as regular inputs to decisions in the water

sector, from short-term water allocation or use to longer-term infrastructure development and operations, ensuring enhanced management of water resources.

- The applications of climate information services can be shown to result in greater efficiencies and effectiveness in using water resources sustainably across the sector.
- Improved access to accurate and reliable climate information results in appropriate and robust design and construction of water-related structures such as culverts, bridges and dams, thus safeguarding large investments.
- Climate prediction services support improved water resources management and prioritized allocation of resources to the wide variety of water demand sectors, including urban water supplies, irrigation systems, flood storage capacities, etc.
- Users of climate information and services in the water sector are fully aware of, and understand the limitations of, the data and science behind the services, taking this into consideration when using the services.
- Climate information services are provided to the water sector in formats and with content enabling direct use in water-related decision-making systems.
- Greater understanding of the impacts of climate variability on water resources availability is enabled by using long time series of climate data adequately and knowledgeably to support hydrological modelling.
- A wide cross section of other users from the water sector benefit, including, for example, power generation, fisheries and conservation, navigation and recreation.
- A wide variety of communication channels between the climate and water communities are open, transparent and easily accessible.

3. ISSUES TO BE ADDRESSED IN IMPLEMENTATION

3.1 Framework Structure

The structure of the Framework is based upon the pillars set out in Section 1.5, namely, the User Interface Platform; Climate Services Information System; Observations and Monitoring; Research, Modelling and Prediction; and Capacity Development. For the Framework to achieve its objectives it is essential that each pillar contributes effectively

to developing and delivering climate services that are based on user needs and result in improved decision making.

The pillars form a coherent, complete system with very strong inter-linkages. The implementation of the Framework will recognize and capitalize on these connections, enabling the development of products and services that are based on users' needs and are derived from high quality scientific and technical systems.

Both the User Interface Platform and the Capacity Development pillars are over-arching components of the Framework that connect directly with all other pillars. User needs serve to define the observations, research and communications requirements, as well as informing the choice of the particular services distributed. Feedback from the users through the User Interface Platform helps to refine the other components as well. Widespread and effective use of climate information requires significant interaction among many organizations and people, including government, civil society, communities and business, and must involve decision makers, climate experts and sector disciplines.

To optimise the benefits of climate services, capacity may have to be strengthened in all areas of the Framework, from educating sector users on the possibilities offered by climate services, and improving the climate information producers' understanding of the user needs, to the underlying observations, data management systems and research capabilities. Capacity development may also be needed for the operational capabilities that will routinely provide user-relevant climate information as well as for the decision support systems that utilize the services.

There are also connections and common issues that affect the four initial priority areas of agriculture and food security, disaster risk reduction, health and water. For example, climate-related disasters in one sector can often present management challenges in the other three sectors. Climate change and climate variability can cause deterioration of the environmental determinants of health, including the availability and safety of fresh water and food, which can result in under-nutrition, nutrient deficiencies and disease. Sea-level rise and increased sea-surface temperatures can reduce water quality and access to drinking water by salinization of coastal aquifers, coastal erosion and land loss as well as affecting the safety and availability of fish and marine food products. Interdisciplinary coordination and collaboration across all priority areas is therefore crucial to enhancing synergies and avoiding duplication.

Building on existing efforts and systems, and extending and enhancing them as necessary, is one of the principles of the Framework. For example, overall assessment of the status and needs for climate observations at the global level is provided by the Global Climate Observing System. On-going development of the World Meteorological Organization Integrated Global Observing System will lead to a more integrated global climate observation capability. The World Meteorological Organization Information System provides an effective means of distributing these observations. The Group on

Earth Observations (GEO) has established a framework for coordinating Earth Observation systems, promoting data sharing, capacity building and user-driven development of applications and services in nine Societal Benefits Areas. Other examples include the current efforts in climate modelling and prediction spread across many operational and research centres and national agencies. The Framework will seek to take maximum advantage of these efforts and facilitate user feedback that will help the modelling centres focus on key needs.

While it is important to recognize the inter-linkages between the pillars, it should also be emphasized that each pillar must receive the attention required to ensure that it makes its necessary contribution to the overall performance of the Framework. On-going monitoring and evaluation along with refinement of all aspects of the product development and delivery chain will be necessary. The success of the Framework implementation will be judged according to the positive impact it makes on the priority sectors and subsequently on other sectors.

3.2 Shortfalls in Current Provision of Climate Services

It is important to recognize that an impressive body of knowledge and systems already exists that can provide a firm foundation for implementing the Framework. However, it is known that across the globe, and especially in developing and least developed countries, decision makers do not always have the information that would help them manage current and future climate risks. Moreover, they are sometimes unsure of how to make good use of whatever information is available to them and are at times unaware that the information they need is something that could actually be provided. In many cases the knowledge to help them exists but has not been converted into services that they can access and use, with the result that climate services often do not reach the people who need them most.

It is essential, therefore, that gaps and deficiencies across current systems and services are identified and that addressing those gaps becomes a key part of the approach to implementing the Framework. Shortcomings in the user interface area are analysed below in relation to the four priority sectors, followed by a discussion of the gaps in the scientific and technical capabilities represented by the Observations and Monitoring; Research, Modelling and Prediction; and Climate Systems Information System pillars. In all cases capacity gaps are also highlighted.

3.2.1 Gaps in meeting the needs of the four priority user sectors

In analysing the deficiencies in climate services currently available in the sectors it must be recognized that the “gaps” vary from sector to sector. In agricultural production, for example, there is long experience in routinely using climate information. However, such experience has often been realized through research projects, and there are major gaps in transferring this experience to operational service provision in a way that can benefit

the Framework's focus on food security. Sectors such as health are relatively new to recognizing the potential of climate services, although there are examples of the benefits of collaboration with climate service providers. The situation also varies considerably from one country to another; in some countries a sector may have strong experience but in another it may have little to show.

There are some issues common to all four sectors that represent opportunities for Framework implementation to enhance services to the sectors. These include:

- Capacity development of professionals and communities to assess, manage and monitor risks of climate variability and change better;
- Capacity development of professionals and communities to access, understand, interpret and use climate information and products appropriately;
- Improved, standardized, and quality controlled sector monitoring data that is compatible with environmental and climate information;
- Monitoring and evaluation of the appropriate, effective, and cost-effective use of climate information for sector decisions;
- Research and prediction of sector impacts associated with climate variability and climate change, in collaboration with the climate research community;
- Development and deployment of early warning systems appropriate to the sector, and other interface tools that help professionals and communities access climate related information;
- Sustainable financial and technical support;
- Better collaboration with the climate community for interdisciplinary policy, practice and research.

A feature common to each sector is the significant under-use of climate predictions and projections, partly because their translation into recommended actions has been poorly developed (with the lack of involvement of users in their development a contributing factor). The probabilistic nature and intrinsic uncertainties of climate predictions, which in many cases are more significant than those normally expected in day-to-day weather forecasts, make it difficult for users to appreciate them or to incorporate them into decision making. More attention must be placed on predicting climate impacts and on improving techniques for helping users make use of inherently uncertain information, as well as helping the climate information providers improve how they communicate to users the probabilistic nature and uncertainties of climate predictions. This will facilitate management options being worked out to transform climate information into practical actions that can be considered in users' decision making. Lessons can be drawn from the methods of sectors (such as health) that have experience in using information associated with uncertainties.

In general, capacity development is a theme that cuts across all deficiencies in fulfilling the potential of climate services. For all sectors to benefit, investment in people, practices, infrastructure, institutions and training is required to stimulate and develop

capacities for assessing and managing climate-related risk. A comprehensive capacity development initiative will have to ensure that relevant stakeholders become involved in climate product generation and delivery, in advising on and using climate information and in facilitating partnerships with organizations and people across the range of necessary expertise on both climate science and the needs of a sector. Developing countries, especially the Least Developed Countries, confront significant difficulties in meeting their climate service needs.

There are current activities in capacity development related to climate issues but they are highly fragmented and vary in focus. They range from building the climate service delivery capabilities of developing countries through improving services geared to specific sectors, to improving the adaptive capacities of specific target groups. What is lacking is an overall strategy to identify crucial gaps in the panoply of climate services and apply resources systematically to deal with these. It will be the task of the Framework to provide the strategy for addressing these gaps by utilizing the five pillars and especially the User Interface Platform.

A problem for developing countries in particular is a lack of good practice guidance or standard methods that have been developed elsewhere as they face growing demands for systematic risk management along with a need to integrate information from seasonal forecasts and climate change projections while coping with incomplete data sets and with difficulties in interpreting and using data. While there are well-established national standards in some countries, they have little or no international resonance. Moreover, adjusting the systems used by sectors to accommodate possible future changes in climate poses certain challenges. In some cases an existing method can be easily adjusted on the basis of current trends and projections but for longer planning timeframes there are few if any well-established methods that can be used with confidence in long-term adaptation planning.

3.2.2 Gaps in current scientific and technical capabilities

The benefits to the various sectors will be realized only if the underlying systems that generate climate data and products and deliver them to users are sufficiently strong. There are areas in all parts of the climate system that are in need of improvement. The main challenge is to assess and collate the gaps in the data chains, followed by enhancing research activities to overcome inter-disciplinary challenges. Lastly, mechanisms to deliver data and products to the sectors in a collaborative way need to be improved or developed.

Observation and monitoring systems

Climate observations consist of *in situ* observations of land, oceans and atmosphere, with increasing use of automated observation systems. In recent decades, satellite data

have contributed very significantly to climate datasets and are the only way to provide global coverage of some parameters.

Such long-term observations (which also include the hydrosphere, biosphere and cryosphere) are vital as a foundation for monitoring climate, climate variability and climate change, for evaluating the effectiveness of policies to adapt to climate change, for climate research and for providing initial states for (and validation of) climate prediction models. To support climate services, records of climate data should be assembled in standardized formats, archived in accessible electronic formats, subjected to quality management procedures including quality control (ideally including homogeneity testing and homogenization). These records should be accompanied by metadata describing the history of the observing site, details of the observational methodology and instrumentation used at the site over its lifetime, the calibration history and any environmental changes in the site's surroundings. These metadata are necessary to ensure that the data are complete as far as possible, free from major gaps, fit for purpose, homogeneous and readily accessible

While the availability of comprehensive climate datasets is sufficient in some regions, there are shortcomings associated with some aspects of the observational networks. These gaps affect understanding and predicting regional climate as well as having an impact on monitoring climate change, which must be continuous, consistent and long term. These deficiencies may be summarized as:

- There are insufficient observations in some regions and a lack of observations for some key climate elements.
- Significant shortcomings exist in the quality, frequency, reliability and accuracy of reporting from many stations to national and international centres, with some stations being silent.
- Challenges are associated with integrating remotely-sensed data with more traditional climate data sets.
- Information about changes in instrumentation (both physically and procedurally) and location ("metadata") is unavailable, which is important for adjusting to any artificial changes in climate measurements (including urban effects).
- Some observations (in the terrestrial, ocean and satellite domains, for example) are part of research-based funding and the activities have not yet been moved to a more permanent operational environment or connected to the existing climate services information systems.
- Climate monitoring from space does not yet have an internationally-agreed architecture, although efforts to achieve this are underway.
- Satellite observations have limitations such as in rainfall estimation.
- The deep ocean is not satisfactorily observed as yet.
- There are gaps in historical climate observations as a result of factors such as inconsistent observations, loss of records, outdated recording systems or formats and inadequate maintenance of observing systems. There is scope for improving

these historical records by employing techniques such as digitization, data rescue and data homogenization.

- There is a need for improved reanalysis and gridded datasets, particularly for data-sparse areas.
- To achieve the full potential and benefits of climate services, climate information needs to be integrated with other scientific datasets such as those for ecological, biological and geomatics data. It should also be integrated with social and economic data.

In addition to collecting climate data, providing a full set of climate services requires access to social and economic data so that climate impacts and vulnerabilities, as well as trends in anthropogenic factors that affect climate change, can be better understood. Among the types of data that will be of interest are those related to population, health, agriculture, transportation, energy, tourism, water resources, sea level and glaciers. For example, those concerned with disaster risk reduction require substantial socio-economic data so that they can combine these data with climate data to understand and cope with the impacts of extreme events. Such data can initially be sourced within the United Nations agencies that are partners of the Framework.

There is a clear and urgent need for closer cooperation and coordination among climate scientists and experts in socio-economic fields to determine the nature, quality and sources of the data required and to facilitate the availability and quality of the socio-economic information needed at the national level, subject at all times to national policies on data access. The Intergovernmental Panel on Climate Change (IPCC) Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation is an example of where this was done. Data need to be easily exchanged across disciplines as well as across geographical borders so that research can better understand these relationships so as to inform better decision making. The difficulty in exchanging data across disciplines has been an impediment in the past.

Research, Modelling and Prediction

There has been significant progress in improving our understanding of the various complex and interconnected components of the Earth system, including physical, chemical, biological and socio-economic factors. Progress has also been made in increasing our knowledge of the role various factors have on Earth's climate system, including Greenhouse Gas emissions, solar activity and the natural variations in climate such as those associated with the El Niño Southern Oscillation.

Along with improved understanding of the climate system there have been substantial achievements in improving the numerical models of weather and climate to enable useful seasonal predictions, particularly for the tropical areas. The model improvements have also enabled decadal predictions to be attempted and climate change projections

to be made, along with progress towards providing regional climate information. Improved modelling has also led to improved climate monitoring due to the use of reanalysis techniques (which also facilitate “hindcast” experiments”). Current and future investments in scientific research, coupled with developments in computational technology, should lead to further advances in our understanding of the climate system and of our ability to make predictions and projections with a higher degree of accuracy about its future state at regional and finer spatial scales. Traditionally, climate predictions and projections have been undertaken as research activities and work on making them operational is relatively recent, needing more effort and coordination.

In addition to on-going research into climate processes, understanding and predicting climate variations on seasonal and annual timescales, projections of climate change, and improving historical data sets, there are major gaps that need to be addressed by research in order to ensure that climate services can facilitate more effective decision making. These are:

- Improving our understanding of how climate affects people and sectors and ensuring that the benefits of advances in climate science can be translated into practical benefits for the users is required. Efforts to bridge the gap between the potential of the science and its use on the ground must be tackled urgently.
- An urgent need exists for cross-disciplinary, participatory research by professionals, researchers, policy makers and practitioners in climate-affected sectors.
- Improvement in exchanging data across disciplines, which has been an impediment to cross disciplinary research in the past, is required.
- An urgent need exists for research capacity in developing countries to undertake the much needed research into the impacts caused by climate variability and climate change - much of the climate-related research currently being undertaken is occurring in the developed countries. Building research capacity in the developing world will be essential to facilitating national research and transforming research results developed elsewhere into nationally and locally relevant services. Increased collaboration between developed and developing country research institutions, along with the increased investment in regional climate centres that house a research capability, will be among the measures vital for addressing this gap.
- Research on developing decadal climate prediction models is a special need, given that this reflects a key planning horizon in decision making. Decadal prediction is a relatively new area of scientific development that will greatly benefit from enhanced availability of, and accessibility to, long-term and high-quality climate time-series.
- Increasing the spatial and temporal detail of the information is a major scientific and technical challenge, but such an improvement has the potential to make a significant contribution to effective decision making.

Quantifying and reducing uncertainties in the predictions, along with providing decision-relevant indications of their validity, is a major challenge. While improvements in predictive skills are evident, they start from a low base and are associated with high degrees of uncertainty, leading to outputs being expressed in probabilistic terms. Probabilistic and uncertain information is often intrinsically difficult to communicate and use, requiring a good deal of research and experience to extract any value from it. Therefore, research on improving communication of probabilistic information to users and decision makers is also needed. The experience of user communities in using short-range weather forecasts expressed in probabilistic terms could be drawn upon.

Regarding global capacity, there is a need to increase significantly the computing capacity available to the world's weather and climate centres in order to accelerate progress in improving climate predictions. The World Modelling Summit for Climate Prediction in 2008 recommended that there should be computing systems dedicated to climate that are at least one thousand times more powerful than those available at that time, yet this insufficiency has still not been addressed adequately. Ensuring sufficient computer storage and communications capabilities to facilitate modelling is also required.

Climate Services Information System

Many elements of a fully operational Climate Services Information System exist, such as the centres that process data, run prediction models and produce and deliver climate products for user benefit. Global elements of the Climate Services Information System are relatively well-developed and regional elements are just being launched, while at national levels there is great disparity in capabilities ranging from non-existent or minimal to highly advanced.

With respect to the mechanisms for exchanging, communicating and disseminating climate data and products, the required technologies available for exchanging climate data and information (including the Internet and mobile telecommunications) are improving at a rapid pace and are being exploited through, for example, the World Meteorological Organization Information System. Mobile telecommunications and the Internet have become useful tools in enabling wider access to many kinds of data, products and services.

Deficiencies in the overall Climate Services Information System can be summarised as follows:

- The capability to process data, run and/or utilise prediction models and produce and deliver climate products for user benefit is not consistent from country to country and from region to region. A significant number of countries can, at present, provide only very minimal climate services or even no services.

- Up-to-date methods and tools for climate data management, analysis and dissemination (both hardware and software) and related training in their use are urgently needed, especially in developing countries; these methods and tools need to be adapted to users' priorities on national and local scales and must be supported by strong provider-user cooperation.
- There are considerable weaknesses in implementing and exploiting data communications systems in several parts of the world, particularly in developing countries. These weaknesses need to be addressed.
- There is insufficient provision of user friendly products and services tailored to user needs. One example of this is a lack of standardized formats. There are multiple sources of climate information concerning the same phenomenon with products packaged in different ways, making it difficult for users to compare and contrast them and to make their own assessments of the key messages so that these messages can be incorporated in their decision making.
- Methods for conveying uncertainties associated with climate products (methods that are crucial for climate risk management) are often poorly developed.
- Restrictions imposed due to national or institutional policies can affect access to many datasets and products that are needed for climate services.

The issue of data policy restrictions has been recognised by, for example, the Group on Earth Observations and by the 16th World Meteorological Congress. At their 64th Session, the Executive Council of the World Meteorological Organization set up a Task Team to examine the issue. This question should be addressed by governments and intergovernmental agencies to ensure that climate services incorporate all the essential data and products and effectively support the protection of life and property and the well-being of all nations while respecting security and other national sovereignty concerns.

3.3 Linkages at Global, Regional and National Levels

The Framework implementation will support and promote effective collaboration with global, regional and national stakeholders and efforts. There will be interactions and exchanges of information between these three levels as described below (the national level also encompasses the sub-national level). Figure 3.1 provides a summary of how the components across the three levels will operate.

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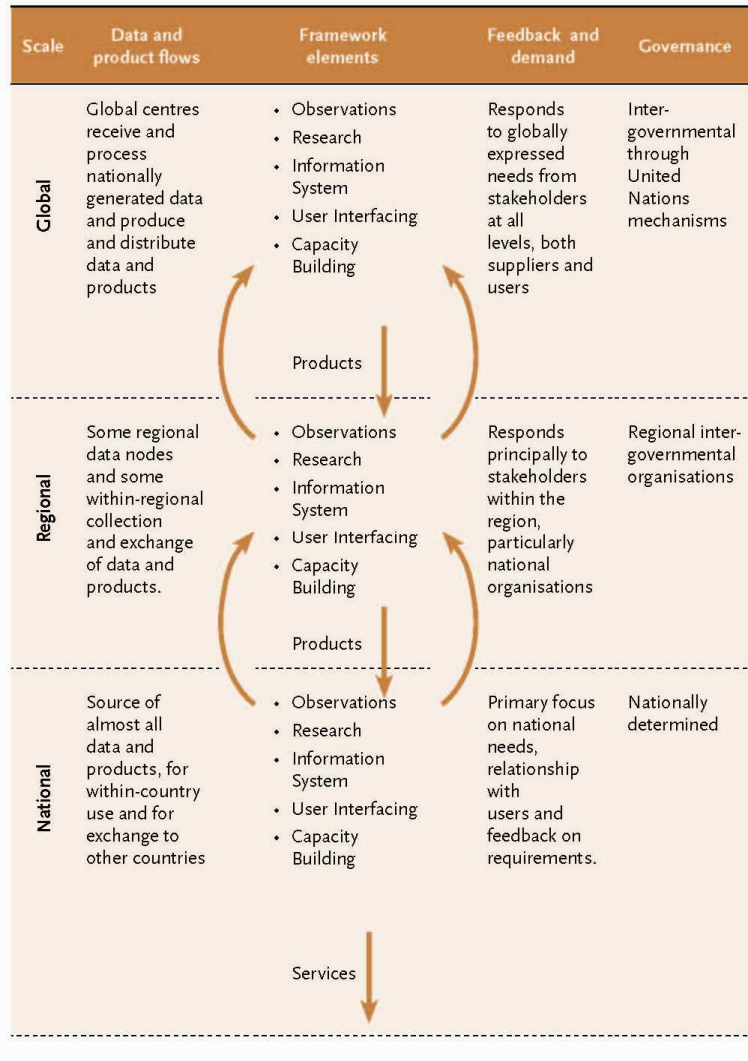


Figure 3.1: A schematic representation of the Framework's global, regional and national components.

At the global level the Framework will focus on defining global goals, needs and large-scale activities required for successfully implementing the Framework. The partners in the Framework will define and coordinate the collection, exchange and provision of global climate monitoring, prediction and projection products, along with other required data and products in the priority areas. Defining the direction of future cross- and interdisciplinary research will occur at this level. The partners will further coordinate and support appropriate data exchange and data archiving as well as major capacity development initiatives, and will establish and maintain standards and protocols on the quality and formats of all data sets. The Framework implementers will build on the existing global, regional and national distribution mechanisms of each partner to transmit and exchange the datasets across national boundaries as well as across disciplines. As an example, the World Meteorological Organization will lend its Global Producing

Centres for Long-Range Forecasts to receive and process nationally generated climate data. They will further distribute climate forecast data and products to Regional Climate Centres and National Meteorological and Hydrological Services so that those centres can integrate them into their climate forecasts and thereby provide better regional and national climate services. In a complementary way, the World Health Organization will work through its Global and Regional Offices to collect, collate and distribute data to the national Ministries of Health and vice versa.

At the regional level the Framework will cooperate with multilateral efforts to address regional needs, for example through knowledge and data exchange, infrastructure development, research, training and providing services regionally to meet agreed requirements. Examples of such regional applications are transboundary river basins, bordering agricultural requirements, cross-border health issues and large scale disasters where, often, one single nation cannot address the issues but a coordinated regional effort can.

Entities such as new and already-existing Regional Climate Centres will play a central role in furnishing climate information and climate services. The actual structure of the Regional Climate Centres will vary according to the specific interests of each region, taking into account each region's specific necessities. Possibilities include a centralized and self-contained multi-functional entity within the region. Alternatively, there could be a network of entities having various functions distributed amongst them. Where national structures are currently not operational, and where such structures are needed and requested by National Meteorological and Hydrological Services, Regional Climate Centres could provide interim climate services and/or products for national distribution. As mentioned in Chapter 2, a specific example of existing regional activities in many areas of the globe is the Regional Climate Outlook Forums. These forums bring together a variety of stakeholders involved in providing seasonal forecasts and generate mutually-agreed consensus outlook products for the region. The forums serve more than half of the world's population, mostly living in developing countries. Some of the forums are beginning to develop seasonal outlooks in collaboration with organizations such as the Famine Early Warning Systems Network and are producing information that is more decision-relevant.

At the national level the Framework will be developed and coordinated by each national government and will focus on ensuring that all participants can express their needs and requirements for successfully implementing climate services that serve the population of the country. Implementation will require enabling access to data and knowledge products, tailoring information to user requirements, facilitating effective routine use of information in planning and management, along with developing sustainable capacities in these respects. The services provided will, as far as possible, be based on the national source of authoritative climate information for that nation in order to minimise confusion and inconsistencies that could arise from multiple national sources of climate information.

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National Meteorological and Hydrological Services/national climate centres will voluntarily support the provision of climate services for their regional counterparts, using climate information furnished by regional and global climate centres and in close interaction with other national hydrographic, oceanographic and marine core service providers. The Framework implementers will support national service providers in producing national data and products. These national service providers will be able to provide information at the local level, a situation which in many countries will constitute a marked improvement compared with their current capabilities. It is at national and sub-national levels that user needs will be identified most clearly, and this user interaction will be a major part of the foundation upon which the Framework is built.

While this document discusses the Global Framework for Climate Services, frameworks for climate services at regional and national levels could be an option to consider.

In pursuing the Framework's objectives, particular attention should be paid to a number of management issues. One is the need for technical expertise. Implementation of the Framework will need the full support of a range of technical experts from both user and provider communities to sustain and advance its activities in order to meet the objectives.

Many governments already commit substantial resources to maintaining and developing climate service functions, not only on a national scale but also by producing global and regional-scale climate products. It is encouraging to note that governments have facilitated the availability of such global and regional products for the benefit of other countries, in the larger interest of the global community that shares common climate concerns. One of the roles of Framework implementation is to demonstrate the value of these efforts and to add further value by assisting in their global coordination. With a small additional contribution to the Framework, substantial national benefits can be achieved. Collecting data according to agreed standards, building regional capacities in a range of climate-sensitive sectors and exchanging data and expertise regionally and globally are activities largely sustained and enhanced by governments' engagement with the Framework. Therefore, a key element of the work plan should be a sustainable, on-going programme that engages all governments to continue activities that participate in and support the work of the Framework.

While countries reflect a diversity of climate-related circumstances and needs, they nonetheless share many common features. Framework implementation will maintain a wide overview of the needs of both developed and developing countries and will actively create opportunities for all countries to interact and share information and experience.

4. IMPLEMENTATION PRIORITIES

4.1 Basic requirements for implementation

The implementation of the Framework will be achieved through the following actions:

1. Establishing the leadership and management capability to take the Framework forward, including creating the structures needed to coordinate the technical work of the Framework, and to monitor its success;
2. Identifying objectives and targets to address current deficiencies in the provision of climate services in priority areas;
3. Creating and successfully delivering a range of projects to address the key shortcomings in the provision of climate services, ensuring they are timely, reliable, useful, properly communicated and easily understood. A number of high-profile projects will be given priority over the first two years of Framework implementation (discussed in Section 4.5) to enable delivery of climate services meeting the needs of climate-vulnerable communities, mostly in the developing world. These initial priority projects will focus on building the capacity of climate-vulnerable developing nations to create sustainable provision of climate services;
4. Developing national and regional capacities to enable the implementation and integration of new initiatives in emerging areas and priority sectors;
5. Encouraging all countries and partners to the Framework to undertake actions to address the gaps and priorities identified in this plan, its annexes and exemplars, and inscribe these actions in a centrally-managed catalogue of activities. This will inspire early action, in keeping with national and sectorial priorities, and will inspire sharing of lessons learned among participants. It also assures a robust Framework in the near-term while priorities are honed through consultations and further development of networks of practitioners.

4.2 Stakeholders and their roles at global, regional and national levels

As implementation takes place, the needs, motivations and capacities of stakeholders will need to be better understood and used to shape an effective, on-going Framework. It will be important that effective relationships between users and providers are developed and sustained and that they are expanded to include intermediaries such as sector specific practitioners, institutes and departments. Stakeholders will be needed from communities representing users, providers, funding bodies and intermediaries, all of which could be relevant at one or more of the global, regional and national levels.

Stakeholder involvement from both the user and provider communities will be essential in shaping the User Interface Platform and Climate Services Information System so that user communities are engaged with information providers to articulate user needs. This involvement is also needed in order that users understand what climate information is available and learn how to interpret it correctly while taking note of its underlying

assumptions and limitations. The same applies to intermediaries bridging gaps between expert knowledge and effective practical application, assisting the flow of climate information.

Partnerships will need to be established within and between developed and developing countries, as well as between developing countries themselves. Stronger partnerships should be pursued with consortia of organizations or other multilateral mechanisms to create effective multidisciplinary working environments.

While governments will have a central role in its governance, for the Framework to be successful other stakeholders will also have to be involved.

4.2.1 Stakeholders at the global level

Global stakeholders represent climate-sensitive sectors and user groups. In the case of many of the international programmes, they represent the global community in developing and providing constituent parts of climate services such as research, modelling, prediction and observations. These stakeholders will have a part to play in implementing the Framework, be it engaging in and developing the User Interface Platform, informing the development and production of global climate prediction products and exchange of data, and/or being involved in major capacity development initiatives and in establishing standards.

At the global level the stakeholders can be broadly classed as follows:

- United Nations Specialised Agencies and Programmes, particularly those involved in activities relating to the Framework's priority areas;
- Multilateral development banks, which are important partners supporting governments around the world to achieve national priorities as well as to create knowledge banks;
- Funders and donors, which are often important participants globally;
- International and intergovernmental organizations involved in developing and delivering, and in some cases investing in, climate services;
- International Programmes, Multi-Agency programmes and international agreements relating to climate services and the Framework's priority areas;
- Users with global interests, such as international companies, industry representative bodies and non-governmental organizations. Some of these may act as intermediaries passing on information, for example disaster and humanitarian relief organisations passing on advice and warnings to users;
- Global climate service providers.

4.2.2 Stakeholders at the regional level

The regional level will be particularly important in capacity development and in building capabilities that are beyond the resources of single nations. The World Meteorological Organization's Regional Associations should assist in implementing the Framework by establishing and interacting with Regional Climate Centres, Regional Training Centres and other appropriate regional centres and by developing regional/sub-regional collaborative capacities. They should help identify user requirements, source experts to assist in implementation activities and support implementation projects. Climate services are delivered at the national and sub-national/local level as well as at the supra-national level, and the capability of National Meteorological and Hydrological Services and other organizations need to be improved to fulfil coordination and operational roles. This improvement can be achieved by close linking of regional to national levels in order to meet user requirements.

At the regional level the stakeholders can be broadly classed as follows, although some stakeholders fall into more than one category:

- Regional initiatives including the Regional Climate Outlook Forums (described in Chapters 3 and 5);
- Multilateral and regional development banks, which are important partners in supporting regional and national priorities as well in creating knowledge banks;
- Funders and donors, which are often also participants in regional, and in some cases national and global, activities;
- Regional service providers including Regional Climate Centres, Regional Drought Monitoring Centres and private sector organisations with a regional scope and scientific organisations with a regional scope;
- Regional associations and regional country groupings with specialized roles, including regional economic groupings;
- Regional offices including development arms of the United Nations as well as regional offices of the aid agencies that represent important interfaces to the users and regional practitioners.

4.2.3 Stakeholders at the national level

Users at the national level are able to obtain information from a range of global, regional and national sources. The National Meteorological and Hydrological Service should play a central role (as described in Section 4.2.4) and Framework implementation should strengthen this role rather than weaken it.

Stakeholders from both the provider and user communities have an important role to play in developing and operating their own frameworks for climate services at the national level in coordination with national governments. Stakeholders would include:

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- Organisations providing climate services, including National Meteorological and Hydrological Services, as well as other research institutes needing to be drawn from beyond the meteorological community to include hydrographic, oceanographic and marine core service providers where they exist;
- National platforms for disaster risk reduction or other similar coordination mechanisms and other national agencies, such as those for agriculture, health, coastal and marine, water resources, forestry, space, energy, the environment;
- Local government and national committees for climate-related problems;
- Private sector organizations that are likely to be both providers and consumers of climate services in many countries;
- Non-governmental organizations, National Societies and community-based organizations;
- The general public.

One challenge that exists at the national level (and to some extent at the regional and global levels) is how best to ensure that consistent, authoritative advice is available to national decision makers. Global and regional products can be used to supplement and inform national advice but there is the potential for inconsistent advice at the national level if such products are provided directly to national users. Any framework operating at the national level would benefit from considering global and regional products when providing consistent, authoritative advice on the basis of which services can be provided. There are also challenges in creating stronger links between National Meteorological and Hydrological Services and domestic climate research centres, where they exist, so that new developments in research can be incorporated into the operational Climate Services Information System effectively. Similarly, developing and implementing the User Interface will depend critically on the relevant practitioner communities as well as on the central role of the National Meteorological and Hydrological Services. Providing relevant climate services requires developing partnerships with relevant intermediary organizations and specialised sectorial institutions. National Climate Outlook Forums (as described in the Capacity Development Annex) facilitate development of “consensus” forecasts and interaction between climate service with users and providers at regional and national levels.

Governments will have a central role in the Framework’s governance and implementation at all levels. Given the international public good and the public financing of most climate information and services, the success of the Framework will be dependent upon a high level of interest and support from governments. Frameworks for climate services at the national level should evolve in the context of government-owned National Adaptation Plans, which exist in many countries.

4.2.4 The role of National Meteorological and Hydrological Services at global, regional and national levels

The above sections recognise the crucial role of a range of stakeholders in developing and implementing the Framework. National Meteorological and Hydrological Services have a long history of, and experience in, providing weather, climate and hydrological information and with appropriate support should be able to deliver an acceptable level of climate services. To a varying degree they collect and distribute meteorological observations, provide the national interface to the global communication system for exchanging meteorological and climatological information, undertake activities directed at improving our understanding of weather and climate, undertake monitoring of weather and climate, provide forecasts, and provide weather and climate services to a range of users to respond to relevant national, regional and global needs.

National Meteorological and Hydrological Services will therefore play a central role at the national, regional levels and in some cases at the global level as well. They will engage with other organizations at these different levels, providing coordination capacity for establishing and operating climate services at the national level where feasible.

The World Meteorological Organization statement on the Role and Operation of National Meteorological and Hydrological Services is being reviewed to reflect more clearly their crucial role in implementing and operating the Framework. A guidance document on frameworks for climate services at the national level will be created, including a description of technical requirements for the National Meteorological and Hydrological Services.

A survey of World Meteorological Organization Member countries showed that more than one third of all Member countries currently do not have the basic capabilities necessary to provide climate services, as discussed further in the Capacity Development Annex. Developing their capacities will be the key to helping these National Meteorological and Hydrological Services fulfil the responsibility of coordinating the provision of climate services for their countries by enhancing capacities in the pillars of the Framework and within each of the priority areas. It should be noted that the majority of National Meteorological and Hydrological Services do have the basic necessary capabilities, and several have full capabilities for providing climate services.

The Climate Services Information System will build on the experiences and production systems of National Meteorological and Hydrological Services, as well as those of other organizations, for developing products and delivering services. It will utilize the World Meteorological Organization's Information System as its primary underlying data dissemination system. National Meteorological and Hydrological Services own and operate an effective and extensive system for collecting and sharing climate observations and in some cases a system for disseminating climate forecasts as well. Framework implementation will contribute to the further development of the capabilities

of monitoring and observing on all levels-- national, regional and global -- by working with the national services, in particular in the countries that do not have the basic capabilities necessary to provide climate services. Climate research is already carried out by some National Meteorological and Hydrological Services, either in-house or through effective collaboration with other research institutions in their countries. In the developing world these efforts shall be strengthened further.

4.3 Priorities for early focus under each priority area

Each priority area has differing needs for climate services to fit into their own operating tools and models and to meet the needs of their decision-making communities. Thus a key to success is to be structured enough to accommodate the points of intersection between the users and providers while being flexible enough to respond to user needs.

Health

There is an opportunity to improve health protection by increasing the climate resilience of the formal health sector and of health-determining sectors such as water resources, agriculture, and disaster risk reduction. To do so, the urgent need for accelerated development and application of climate services to support development must be addressed; this is a necessary step in adapting to climate change. The Health community expressed five key recommendations at World Climate Conference-3 to for the Framework to respond to the Health priority area. These called for:

- Full engagement of the public health community under the leadership of WHO;
- Developing capacity and providing evidence for policy and practice through research and training;
- Investing in a public service platform to encourage cross-sectoral interaction and providing advisory services for the health sector;
- Improving health monitoring and surveillance systems by sharing data, information and capacity development at all levels to achieve the most elementary public health adaptation, especially for least developed countries;
- Prioritizing the development of the Framework as it relates to health, developing a clear framework, and linking institutional mechanisms with health outputs and responsible actors. This should be done by existing partners acting together.

Therefore, the Health Sector has identified four priority action areas to strengthen:

- Communication and Partnerships
- Health and Climate Research
- Capacity Development
- Mainstreaming Climate Information to Health Operations

An overarching priority and first step for the health community worldwide is to take stock of existing best practices, strengthen existing partnerships and invest in research to improve the understanding of the influence of climate on health outcomes.

Water

The water communities call for the following priorities for early focus:

- A development-centric rather than a climate-centric approach based on water sector needs;
- Implementation through existing programmes that can be adapted according to requirements;
- Application of a mix of top-down and bottom-up approaches to increase the climate resilience of water-related activities;
- Focus on collaborative programmes related to managing floods and droughts;
- Enhancement of partnerships;
- Development of national coordination structures that are critical for the functioning of the User Interface;
- Establishment of well-defined horizontal links between the five pillars. The Water Exemplar indicates that in particular the boundaries between the User Interface Platform and the Capacity Development pillars should be seamless.

Agriculture and Food Security

The agriculture and food security communities call for the following priorities:

- Development of the leadership and management capability needed to ensure climate risks and resources for agriculture, livestock and fisheries are handled properly;
- Definition of the needs of agriculture, livestock and fishery users for climate information;
- Provision of technical support for the research, capacity development, communications and operations of agriculture, livestock and fishery sector functions;
- Communication and advocacy promoting effective use of climate information within food security policy, research, and practice with user feedbacks.

Disaster Risk Reduction

The disaster risk reduction communities call for the following priorities:

- Capacity building for disaster risk reduction: training climate information users and providers to improve communication;
- Institutional/policy setting: ensuring that regional and national frameworks for disaster risk reduction include a climate information component;

- Setting standards and monitoring progress for climate service provision, including through the Hyogo Framework Monitor;
- Early warning and preparedness: engaging with disaster risk management institutions and local authorities;
- Local-level engagement: through community-based organizations, and civil society organizations such as Red Cross and Red Crescent Societies.
- Advocacy/media: training the media, for example;
- Global agenda coordination on climate change, sustainable development, linkages with key sectors, the private sector and others.

These priorities will evolve as the Framework matures and initial successes are realized. For example, initial strengthening of regional support networks and institutional capacities will be needed for subsequent development of national capacities to enable the up-scaling of the initial projects during the 6- and 10-year horizons. In addition, increasing attention might be given to areas other than agriculture and food security, health, disaster risk reduction, and water after the first few years of implementation.

4.3.1 Deliverables and targets over 2-, 6- and 10-year horizons

The Framework will be implemented over 2-, 6-, and 10-year timeframes to facilitate review at the World Meteorological Congress sessions. The first two years are a start-up phase for establishing the Framework's infrastructure and for initiating and facilitating demonstration projects in the four priority areas. The Framework's implementers will emphasise strengthening regional support networks and institutional capacities that will be needed for subsequent development of national climate service capacities.

During the second phase of implementation (the development phase), the initial two-year demonstration projects will be replicated in other parts of the world so that by year 6 there will be worldwide improvements in climate services for the four priority areas. These projects will provide measurable progress in realizing the Framework's goals by year 6, and a mid-term review of the Framework during this period will include consideration of such progress. After agreeing on new priority areas there will be an extension of projects beyond the initial four priorities. Significant improvements in national climate service provider capabilities will be realized during this phase because the regional infrastructures will be in place for supporting the development of national capacities.

After ten years of implementation, wide-reaching benefits from improved climate services will be evident: there will be improved services throughout the world, across all climate-sensitive sectors and across global, regional and national spatial scales. The improved provision of climate services will facilitate the reduction of society's vulnerability to climate-related hazards and the advancement of the key global development goals.

The two-year horizon

Over the first two years of the implementation of the Framework it will be essential to:

1. Implement the agreed governance structure of the Framework, including establishing a secretariat in support thereof;
2. Initiate a reporting structure that enables national, regional and global entities to report on their efforts to meet near-term targets and address gaps in current climate service capabilities. Lessons will be learnt during the implementation and a reporting structure needs to capture and communicate these;
3. Design and implement a set of projects that demonstrate the value of climate services, primarily in climate vulnerable developing countries, to ensure sustained and expanding interest on the part of donors;
4. Develop national and regional capacities to enable the implementation of new projects and the scaling-up of the initial activities to other areas and sectors.
5. Engage the user community globally and demonstrate the value of climate services at regional and national levels. Genuine cross-disciplinary projects with successful outcomes as well as participation in the governance of the Framework will be indicators of the level of success in this engagement.

Implementing the agreed governance structure will be essential for coordinating and monitoring project implementation, formulating standards, ensuring that international agreements and mechanisms are in place for exchange of data and knowledge, mobilizing resources from international donors and raising awareness through communications campaigns among others.

The priority projects during the first two years will focus on creating and growing partnerships and building trust with users, in particular by developing the User Interface Platform. Such projects must be demonstrably viable and useful. Some of these projects will directly develop and deliver national and regional implementation activities – projects that integrate activities among several countries that will demonstrate international collaboration and which could serve as examples of regional activities. Identifying demand for climate services, and ensuring that this demand is informed by sound scientific research, is fundamental to guaranteeing sustained support for the Framework. As a result, in the initial two-year phase, activities from all the pillars are to be selected to build and inform demand for climate services as well as to facilitate scaling-up of the initiatives in subsequent years. Successful delivery of these projects during the first two years of the Framework will demonstrate tangible progress, build trust with donors and facilitate building business cases for future funding of the Framework. Other priority areas will be considered for subsequent phases as issues emerge during Framework implementation.

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These initial projects will guide the development of projects on the 6- and 10-year horizons and in setting deliverables and targets for those medium- and long-term horizons.

The key milestones for the first two years are as follows:

Deadline	Milestone
End January 2013	Distribute the Implementation Plan to stakeholders after updating it with the outcomes of the Extraordinary Session of the World Meteorological Congress. This Plan will be considered at the inaugural meeting of the Intergovernmental Board
End December 2013	Undertake the organisation building phase as described in the governance mechanisms approved by the Extraordinary Congress, including establishing a secretariat to support the Framework, establishing the necessary management and executive (technical) committee structures, convening the first meeting of the Intergovernmental Board and developing programmes to undertake immediate implementation priorities.
End June 2013	Convene a series of forums to agree upon the management of individual demonstration projects.
End December 2013	Convene a series of pillar-specific dialogues at global and regional levels (beginning in Africa) to organise management of activities.
End December 2014	Complete demonstration projects from the priorities for the initial two years.

The six-year horizon

After six years the Framework implementation should have facilitated access to improved climate services worldwide in the initial four priority areas and have initiated activities in other priority areas. Additionally, since some of the activities implemented in the first two years will be on-going initiatives, they may only start realizing significant benefits in the six-year horizon and beyond. These on-going activities are important in preparing for and enabling other activities that are planned to take place during the longer-term horizons. For example, although the initial focus will be on developing the capacity of Regional Climate Centres to provide nodes for strengthening national capacities, work has to begin at the national level from the commencement of Framework implementation. In many cases the process of developing national human resource, infrastructural and institutional capacities needed to implement climate services in all countries will probably take a number of years. Moreover, other processes cannot be rushed because they need to follow the formal procedures that

have been established for reaching international agreement on standards and procedures.

The High-Level Taskforce laid out a roadmap indicating that the Framework should involve closely at least five United Nations agencies or programmes, should have active technical committees in place encompassing the five components (Capacity Development; Research, Modelling and Prediction; Observations and Monitoring; Climate Services Information Systems; and the User Interface Platform), should have an active communications programme to ensure that services are delivered effectively and should have actively engaged in at least US\$ 150 M of climate-related development projects. A mid-term review of the implementation of the Framework is planned for the end of the fifth year. The terms of reference for this review will be prepared through an intergovernmental process and should include evaluation, *inter alia*, of the success of the Framework in meeting the objectives and deliverables laid out in this Plan.

The ten-year horizon and beyond

After ten years the Framework should have facilitated access to improved climate services worldwide and across all climate-sensitive sectors. The High-Level Taskforce laid out a 10-year roadmap indicating that the Framework should involve closely at least eight United Nations agencies or programmes and that it should have actively engaged in at least US\$ 250 M of climate-related development projects that have been assessed as useful in meeting user needs.

Beyond these ten years the level of project funding will be proportionate to the global community's assessment of the needs to be met by climate services and the benefits that will flow from these services. If the Framework has met its goals, all communities will have access to basic climate services and these services would reasonably be expected to be far superior to those that are available today.

For the User Interface Platform, generic targets for the two-, six- and ten-year horizons have been laid out for both organizational and operational functions, targets that apply to all of the priority areas (table 4.1):

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TARGETS	Two Year -2015	Six Year -2019	Ten Year -2023
Organizational	Establish institutional mechanisms, office, partner's framework time schedules	Maintenance and improvement of engagement in institutional mechanisms	Maintenance and sustainability of institutional mechanisms
Operational			
Feedback	Initialize projects, incorporate existing projects	Identify new projects and processes	Technical and operational support for continuation of existing projects
Dialogue	Develop initial technical guidance with Pillars Establish work plans	Develop more refined technical guidance, training curricula	Widespread use of technical guidance & training curricula
Outreach	Establish communication strategy	Awareness and partnership building with priority areas	Sustained advocacy partnership building with priority areas
Monitoring & Evaluation	Review of performance and lessons learned	Expansion and continuation of existing projects	Ensuring sustainability and mainstreaming of climate services

Table 4.1: organizational and operational targets for the User Interface Platform

4.4 Guidelines for identification of activities/projects

The eight Principles of the Framework, as articulated by the High-Level Taskforce and described in Chapter 1, should be used to guide the identification and implementation of all activities and projects over the life of the Framework.

Priority activities and projects implemented in the first two years should meet the following additional criteria and should:

1. Be aligned with at least one of the four priority areas (disaster risk reduction, water management, agriculture and food security and health);
2. Address at least one of the gaps in current scientific and technical capabilities as identified in Chapter 3;
3. Contribute to at least one of the implementation priorities identified by the High-Level Taskforce, namely:
 - establish a secretariat;
 - develop national capacities for providing climate services by building the User Interface Platform and/or upgrading those National Meteorological and Hydrological Services with basic climate service capabilities;
 - develop regional capacities to assist national capacities in providing climate services;

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- ensure access to required climate-relevant observations, for instance by filling in critical gaps, sustaining and developing observational networks, establishing data management capabilities and improving the telecommunications network;
 - build research capacity by establishing fellowship programmes and/or innovative instrumentation research programmes and promoting multi-disciplinary research initiatives;
4. Take into account the following:
- Is the activity achievable in a two-year time frame?
 - Does the project involve or contribute to activities in Least Developed Countries, Small Island Developing States, Land-locked Developing Countries or other regions or countries highly vulnerable and sensitive to climate-related risks?
 - Does the project build upon something that already exists by expanding the area, locating in a new place, making it operational or broadening its scope?
 - Does the project fit within the initial budget estimate in the High-Level Taskforce report?
 - Does the project address the Feedback, Dialogue, Evaluation or Outreach outcomes of the User Interface Platform?
 - Does the project build upon, and not duplicate, the partnerships in place among existing organizations and groups?
 - Does the project fill the objectives, agendas, work plans, goals and missions that have already been agreed to by the partner organizations?

In selecting where to implement specific projects, the Framework will bring together service providers, donors and user communities with an urgent requirement to agree to establishing projects in the priority areas to develop capacity in a sustainable manner. These projects will need to have a high likelihood of successfully delivering within the two-year time frame and be likely to provide maximum benefit in order to demonstrate progress and the success of Framework implementation. These projects can then be up-scaled for the 6- and 10-year time frames, benefitting from successes and lessons learned from the initial implementation activities.

The initial priority projects and leadership and management activities needed to begin implementing the Framework are described in the following sections.

4.5 Initial priority projects

The following table and text summarises a selection of high priority projects. These projects were formulated through a consultative process undertaken in developing this Implementation Plan. The projects will ensure that significant early progress is made towards the Framework's goals. A more extensive set of activities and projects are proposed in the Annexes and Exemplars. As the Framework progresses and further consultations take place these lists are likely to evolve. None of this precludes

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participants from designing and implementing activities and projects that fill gaps and address identified priorities based on the guidelines in Section 4.4.

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	Project	Priority areas and main Annex	Geographic scales	Lead organisations
1	Establish frameworks for climate services at the national level in developing countries	All areas. CSIS	national	WMO
2	Strengthening capacity for disaster risk reduction and early warning	Disaster Risk Reduction. UIP	national, regional	UNISDR, WMO, IFRC, FAO
3	Improving communications between the climate and agriculture and food security communities	Agriculture and Food Security. UIP	regional, national	FAO, IFAD, WMO
4	Partnering climate services and water resources management	Water. UIP	regional, national	GWP, UNESCO, WMO, FAO
5	Developing National Climate and Health Working Groups	Health. UIP	national	WHO, WMO
6	Improving decision-making processes concerning climate-related risks	All areas. RMP	all	WCRP
7	Strengthening regional systems for providing climate services	All areas. CD	regional	WMO
8	Large-scale data recovery and digitisation	All areas. OBS	all	WMO

Table of a selection of high priority projects for the first two years. The acronyms used for each Annex are CSIS for Climate Services Information System; UIP for User Interface Platform; RMP for Research, Modelling and Prediction; CD for Capacity Development; OBS for Observations and Monitoring.

Project 1 – Establish frameworks for climate services at the national level in developing countries

Objectives: Identify the national entity(ies), most often a National Meteorological and Hydrological Service (NMHS), responsible for maintaining the official climate record and for operational climate information products constituting the essential climate science inputs to climate services at the national level that are valuable to government institutions, socio-economic sectors and the broader community; identify the stakeholders and key communities of users of climate data, products and services; introduce the different communities of practice, allowing them to realize and appreciate the gaps separating them; build common ground, identifying areas of joint complementary work and overlapping interests as a basis for partnerships, and whet a thirst for further interactions; close the gap, and identify a way forward to sustain the bridge between participants for further climate information communication from scientists to community end-users and back; develop and assign key responsibilities to users and producers in the end-to-end chain of delivery from data collection through the use of specific climate services to enhanced actions based on climate-sensitive decision making; where national capacity is lacking, determine which functions should be delegated to regional and/or international parties.

Benefits: A clear set of guiding principles, legal mechanisms and operating procedures that will allow for the structured and secured improvement of the quantity, quality, delivery and use of climate services at the national level. These will be designed through the active engagement of users. Enhanced actions are then possible based on climate-informed decisions taken in an internally consistent, authoritative and dependable manner and feeding into both government policy and socio-economic applications.

Deliverables/outcomes: Memoranda of Understanding between and among providers and users of climate services clarifying the interdisciplinary working mechanisms at the national level and specifying what is expected from regional and global providers; Memoranda of Understanding among users of climate information and services clarifying the process for coordinating action based on climate information; agreement on the timing, content, and format of a minimum set of climate products to be provided to specific users, and identification of communication and feedback mechanisms to ensure enhanced conditions at local levels; agreement on procedures for issuing early warning for fast- and slow-onset hazards.

Indicators and assessment measures: A number of signed Memoranda of Understanding; meeting reports; operational production of agreed climate information, measured by frequency and timeliness of production and evidence for evolution of product formats in response to documented feedback; published specifications for issuing early warnings and examples of issued warnings in the event that the agreed criteria are met; reported use of climate information and enhanced conditions at the local level to be documented through regular feedback; quantity and quality of the

communication of success stories and issues to be improved, found in local and national information channels.

Project 2 –Strengthening capacity for disaster risk reduction and early warning

Objectives: Establish effective communication between climate service providers and the users of the information they provide to improve early warning. This will improve climate service provider understanding of their users' information requirements, help align users' expectations with service capabilities, promote the establishment of plans for communicating forecasts and warnings to pilot-project communities and for monitoring the effectiveness of implementation.

Benefits: Build trust between climate service providers and users; improve the usability of climate services provided by local NMHSs; enable early warning to high-risk populations in pilot communities; provide forecasts for decision making to pilot communities.

Deliverables/outcomes: The project will implement five workshops of three days in five countries. Each workshop will produce a strategy for communicating a defined set of climate services to a pilot community and an agreement on criteria for evaluating the effectiveness of the services. The results of the workshops include opening communication channels between national meteorological services and national disaster risk management offices, establishing a national system for relaying warnings and developing partnerships with emergency preparedness organizations. Solid evidence of sustained improvement of operational services provided through these workshops would be necessary input to the new activity.

Indicators and assessment measures: The workshop participants will agree on the criteria for evaluating the effectiveness of the communications strategy.

Project 3 – Improving communications between the climate and agriculture and food security communities

Objectives: Improve the supply and uptake of relevant meteorological and climate information for rural producers in West Africa through: 1) strengthening and expanding the model of Roving Seminars on Weather, Climate and Farmers in the Sahelian region, and 2) improving communication between farmers, extensions agents, NGOs, FAO and National Meteorological and Hydrological Services.

Benefits: Communities and farmer organizations are strengthened with knowledge obtained by using Information and Communication Technology; tools for communication are extended by improving web-based storage of agricultural information and by increasing connectivity in rural communities.

Deliverables/outcomes: Collaborative partnerships between WMO, FAO, NGOs and other partner agencies, policy makers and NMHSs; established and functional systems for disseminating information and evaluating the benefits; organization of roving seminars and farmer field days. The initial target region will be West Africa, with expansion to other African regions.

Indicators and assessment measures: To be determined through on-going dialogue.

Project 4 – Partnering climate services and water resources management

Objectives: Establish a consultative process whereby the research and operational sections of the climate and water communities can interact to identify, implement and evaluate a range of climate information services supporting improved water resources management in a changing world.

Benefits: Increased understanding of the impacts of climate variability and change on water resources availability in areas at greatest risk; decisions made on the basis of better information resulting in less wastage of a valuable resource and increased sustainability of the activities planned around the supply; augmentation of water supplies in response to increasing population or other demands is planned more effectively by having better information on climate variability and change; improved decision-making processes associated with storage operations by applying high quality seasonal climate outlooks; decisions made on the basis of better information, resulting in less wastage of a valuable resource and better sustainability of the activities planned around supply; high quality seasonal climate outlooks that can be readily included into decision-making processes associated with storage operations.

Deliverables/outcomes: The deliverables from this project will be a consultative process whereby the research and operational sections of the climate and water communities can interact to identify, implement and evaluate climate information services. The process will be tested in areas of greatest water stress and fine-tuned to account for particular issues that arise at regional, national and local levels. Two sets of projects will target water resource management issues in Least Developed Countries in Africa and Asia. They include: establishing five projects in trans-boundary river basins identified as water scarce regions incorporating a UI Platform linking the hydrological and climatological communities; establishing five projects in river basins identified as

highly dependent on snow or glacier melt for their water resources incorporating a UI Platform linking the hydrological and climatological communities.

Further deliverables will include both climate information services closely aligned with water resources decision-making processes and the tools by which they can be developed, implemented and promoted by the climate and water communities.

Indicators and assessment measures: There are considerable benefits for the water priority area within all timescales from providing well-developed and targeted climate services. This area is arguably, the most climate-sensitive of the Framework's priority areas. However, linkages with other areas are strong. For example, better climate services with regard to water will also improve food security in irrigated and rain-fed areas, reduce risk of water borne disease and improve sanitation, and in the extreme manifestations of water availability (floods and droughts) reduce disaster-related deaths and damages. Water resource management is a day-to-day and year-to-year operational activity and involves long-term strategic planning issues as well.

Project 5 – Developing National Climate and Health Working Groups

Objectives: Establish national mechanisms whereby climate research and operational groups can interact with health actors to identify, implement and evaluate jointly the use of climate information services in support of improved health protection. It will serve as a model for broader applications and help establish standard tools and references for expanding the model in other countries and regions.

Benefits: The capacities of both health and NMHS partners will be developed through training, linkages to international and regional experts, and via a structured mechanism for collaboration that will assist health actors in implementing climate-informed policy, research, and practice. The capacity of national networks can be further strengthened by linking national collaborators, e.g. through bi-lateral working groups and through regional and international interactions in regional and global forums.

Deliverables/outcomes: Working groups established in 3-5 countries; guidance on the establishment of national institutional mechanisms for collaboration between climate and health; linkages between National Working Groups in West/East Africa; development of applied sessions within Regional Climate Outlook Forums (RCOFs) that cater to health needs; linkage of National Working Groups to RCOF processes as applied activities; improved capacity for health and climate applications; national activities to fulfil and implement UNFCCC processes (e.g. National Adaptation Plan of Action, Vulnerability and Adaptation assessments) and climate-enhanced national emergency preparedness and management plans; engagement of WHO and health partners at National and Regional levels.

Indicators and assessment measures: national work plans shared; national Working Groups attend RCOFs and cite benefits from specific activities; health activities held at RCOFs that address the needs of the national groups (emergency preparedness, infectious disease control); guidance documents published; public health preparedness plans routinely use climate information.

Project 6 – Improving decision-making processes in climate related risks

Objectives: Demonstrate, through analysis of case studies, how existing climate information can improve decision making in the Framework's priority areas. Enable users to exploit climate information, with its inherent uncertainty, more easily and more effectively in their decision making, and minimize possible misinterpretation or misuse of complex climate information, for example through climate risk assessments involving collaboration between providers and users. Currently there is a large gap between users' needs for actionable and valuable information and the climate services capability to serve those needs. This activity will improve the ability of users to incorporate probabilistic climate information into their decision-making processes in order to prepare for and manage climate-related risks. The activity will engage both the users and the providers of climate information in developing tools and techniques to extract useful and actionable information, thereby bridging the gap between users' needs and climate services capabilities. It will develop new and improved methodologies to exploit more efficiently the emerging prediction capabilities being developed by climate science. It will coordinate interdisciplinary research in support of decisions that are influenced by climate variability and climate change.

Benefits: Users will be able to use climate information in their decision making more easily and more effectively; climate services and climate science will be of more use to society and used more widely; demonstrating the benefits of climate services will make it easier to attract funding for future research to further improve climate services; and the risk of possible misuse of climate information will be reduced.

Deliverables/outcomes: Case studies demonstrating how existing climate information can improve decision making in the Framework's priority sectors; development of a multi-disciplinary research programme (meteorology, natural science, social science, economics) to improve the flow and use of climate information to inform decisions; research into how to make uncertain probabilistic information fit into decision support systems, communication of complex science-based information, and assessments of impacts of changes in climate on natural and human systems.

Indicators and assessment measures: Four case studies, one for each priority area, demonstrating how existing climate information can improve decision making; a multi-disciplinary research project created for approval by the Framework implementers.

Project 7 – Strengthening regional systems for providing climate services

Objectives: To enable the development of climate service capacity and accessibility in the most vulnerable developing countries by promoting and strengthening regional-level infrastructure including Regional Climate Outlook Forums, and WMO Regional Climate Centres and their partnerships with regional mechanisms in the four priority areas..

Benefits: At present, climate services in many vulnerable countries are weak. While the capacity to develop and deliver climate services at the national level is being developed, a network of strong Regional Climate Centres can play an important role in quickly supporting improved development and delivery of national climate services. Roles the Regional Climate Centres can take include: providing national climate information providers, where requested, with expertise in communicating with users and responding to user needs; generating and coordinating regional climate information products such as regional climate monitoring bulletins, long-range forecasts, and downscaled climate change scenario products; providing representation on regional research programmes such as Meningitis Environmental Risk Information Technologies (MERIT) initiative; and, hosting training workshops for national service providers. . Improving and standardizing methods and tools for Regional Climate Centres, plus building technical and communication skills of personnel, will result in better, more reliable products and enhanced interaction with users. Strengthening and expanding user interface activities such as Regional Climate Outlook Forums, and improving access methods such as use of internet technologies will provide users with improved access to and dialogue with climate providers.

Deliverables/outcomes include facilitating the launch of the demonstration phase of new Regional Climate Centre operations in critical areas; fast-tracking the capabilities of Regional Climate Centre candidates to meet designation criteria; supporting and accelerating outputs from regional climate research; standardizing technical procedures and tools; enhancing capacities for developing and coordinating an operational flow of information and products from Regional Climate Centres to national climate service providers; guidance on the optimal utilization of Regional Climate Centre products; training in the use of Regional Climate Centre products as required; promoting sustainable funding structures for Regional Climate Outlook Forums in vulnerable areas; and guidance on maintaining Regional Climate Outlook Forum activity during periods when there is no opportunity for meetings.

Indicators and assessment measures: Numbers of Regional Climate Centres providing mandatory minimum functions; level of regional ownership/participation and sustained funding for RCC operations; numbers of countries served by regular Regional Climate Outlook Forums; types of products (e.g., seasonal outlooks, monitoring products, bulletins and advisories) issued by the centres; extent of participation, by

sector, of user communities and partnering agencies in Regional Climate Outlook Forums (numbers and frequency); satisfaction of user groups with the Forum process and products, including the extent to which users feel products are tailored for their use and are useable; extent to which Forum products are used in decision making at national and regional levels.

Project 8 – Large-scale data recovery and digitisation

This project will provide support to global and regional Data Rescue and Digitisation (DARE&D) initiatives and develop new ones as required. The target initiatives are those using modern techniques, procedures and tools to recover and digitise old and recent climate records at global or regional levels and to promote the use of these techniques in developing and Least Developed Countries. This will include training workshops for NMHSs and other organisations working in climate data collection. The ultimate goal of the project is to enable access and use of high-quality long-term climate data with daily time resolution and to reconstitute and assess the changing behaviour of climate extremes affecting water, agriculture and health, providing adequate databases on climate hazards to support disaster risk reduction. Note: although not part of this proposed project, there is also a need to provide support to global and regional DARE&D initiatives to recover and digitise non-climate records relevant to climate-relevant decision making such as data on disease outbreaks of and heat-wave mortality rates.

Objectives: Enhance the capacity of NMHSs and other climate data communities to accelerate recovery and digitisation of old and recent climate records; set up an internationally coordinated initiative for Climate Assessment and Data sets (ICA&D) for developing and providing high quality climate assessments and data sets based on the output of enhanced DARE activities worldwide.

Benefits: Data Rescue and Digitisation of climate records is an important area of work. This project will feed climate data sets into the CSIS with the required quantity, quality, and coverage to support the provision of climate services, in particular at regional and local levels.

Deliverables/outcomes: Provide long-term, high resolution and high quality climate data sets and related products for climate assessment and sector applications.

Indicators and assessment measures: Number of NMHSs and climate institutions contributing to ICA&D through Data Rescue activities; increase in the availability of digitized and homogenized climate data sets.

4.6 Implementation approach

An important part of the near-term strategy for implementing the Framework is designing and carrying out projects that target the needs of vulnerable developing and Least Developed Countries that are currently least able to provide climate services. To this end, a high priority for the Implementation Plan is to carry out quickly a number of high profile capacity building projects to enable delivery of climate services meeting the needs of climate-vulnerable communities in the developing world. These fast-track projects aim to build the capacity of developing nations to sustain the provision of climate services over the long term and will be funded largely through development aid. These projects will also demonstrate progress in implementing the Framework to users, providers and funders.

In addition to these goal-oriented activities and projects, successful implementation of the Framework will require process activities to be undertaken in parallel, i.e. to establish the leadership and management capability to take the implementation forward and to ensure effective management and delivery of Framework-based activities.

The approach to implementing each activity and project will be influenced by whether the activity is undertaken at the global, regional or national level. The implementation approach should encourage efficiencies, delineate responsibilities and maximize value at each level. For example:

- The development of international standards and international products will best be accomplished at the global level.
- Access to information, development and delivery of products for regions and some aspects of training and capacity will best be undertaken at the regional level.
- Developing and delivering products for the national and local levels, establishing relationships between producers and users as well as training and capacity development will best be undertaken at the national level.

4.6.1 Implementing Framework management

In implementing the Framework's near-term objectives, particular attention should be paid to the following management issues:

- The need for availability and skill in technical expertise;
- Coordination capability of the United Nations;
- Government commitments;
- Monitoring and evaluating the performance of the Framework and revising targets and procedures as the Framework progresses;
- Developing strategies for external communications and resource mobilization;
- Establishing internal working methods, particularly for communications and for deciding on implementation priorities;

- Undertaking the global implementation of the Framework and providing guidance for developing climate services at the regional and national levels.

Successful implementation of the Framework will be measured most effectively at the national and local levels, particularly in climate-vulnerable developing countries. With this in mind, at the outset of Framework implementation guidance for developing and implementing frameworks for climate services at the national level will be established and will be made available as part of the activities and projects described in Section 4.5. A national framework will be a coordinating mechanism that enables developing and delivering the climate services required at national and local levels. Such a framework will include developing and delivering national climate services that, through a collaborative network of entities, create and provide authoritative, credible, usable and dependable science-based climate information and advice that is of value to government institutions, socio-economic sectors and the broader community. A national framework can also facilitate identification of one or more officially mandated entities that have responsibility for the national climate record and for operational climate information products that constitute the essential climate science inputs to national climate services. In line with Principle 7 (the role of the Framework will be to facilitate and strengthen, not to duplicate), in many countries the officially mandated centre will either be, or will involve close links with, the National Meteorological and Hydrological Service. It will be for each country to decide about such mandates.

Similar consideration will be given to defining regional frameworks for climate services at the outset of the implementation of the Framework, involving Regional Climate Centres and Regional Climate Outlook Forums where appropriate.

4.6.2 Implementing the priority projects

The initial implementation approach for priority activities and projects will be as follows and will be in line with the Principles of the Framework:

- Work with existing entities;
- Build upon activities already underway;
- Identify and engage with the organizations most involved in the priority activities and projects in order to identify overlaps between donor's interests, countries'/society's needs and the initial priority activities and projects;
- Learn lessons from the initial projects in order to move steadily toward sustainable and valued service offerings. These projects should create real outcomes and demonstrate benefits that inspire donor communities, service providers and users.

While the priority projects listed in Section 4.5 are illustrative, all partners need to be actively engaged in developing further the Framework's implementation plan and future priority activities and projects.

4.7 Resource requirements for the priority projects

The High-Level Taskforce noted that by far the bulk of implementation resources will come from the routine contribution of services and the participation of experts supported by governments and stakeholder organisations as part of their ongoing mandates and programmes. The tasks of implementing the Framework in the developing world will require support from development agencies and banks, particularly for the new initiatives proposed, and should also be supported by the country programmes of the United Nations System.

Nevertheless, the Framework will only succeed if it has a strong standing capability to lead and manage the functions of the Framework. This involves four main expenses: meetings of the governance group and its management committee, support of technical committees, operation of a Secretariat and initiation of studies and projects. The costs associated with the various aspects of governance such as the Secretariat and Intergovernmental Board meetings, are itemized in the separate Governance document.

The High-Level Taskforce noted that in broad terms the costs associated with initiating and designing projects might require consultants and meeting expenses of US\$ 250,000 to 400,000 per year, which could amount to US\$ 2 M in 2013, rising to US\$ 3 M in 2014. In addition, the costs of the initial high priority projects listed in the table in Section 4.5 amount to US\$10-15 M over the first two years of the Framework.

Table 4.2 summarises the High-Level Taskforce report's estimate of the costs of implementing the Global Framework for Climate Services. These costs are small in comparison with current global expenditures on observations collection with, for example, the Global Climate Observing System estimate of current annual expenditures on the collection of climate observations of US\$ 5 to 7 B. The aim of the Framework is that a large net increase in global, regional and national capability to improve climate-related decisions be achieved for a relatively small investment in increased global capacity. This leverage arises because of existing capabilities that can be deployed to improve climate services in the most vulnerable communities.

Aggregate of capacity development projects (in millions of US\$)	2013-2014	2015-2018	2019-2022
Building capacity of the User Interface Platform	1	21 to 34	21 to 34
Building national climate service capacity	1 to 2	53 to 64	50 to 60
Building climate centre capacity	1 to 2	76 to 90	80 to 94
Building observations capacity	1 to 2	80 to 100	28 to 40
Building research capacity	3	7 to 13	18 to 27
Implement a management capability	2 to 4	13 to 17	13 to 16
TOTAL	8 to 13	229 to 284	189 to 237

Table 4.2: Aggregate costs, in US\$ M, for implementing capacity development and Secretariat support as estimated by the High-Level Taskforce.

4.8 Monitoring and evaluating the implementation of activities

Establishing criteria for the success of the Framework is important in order to set out realistic objectives for its organization, and to serve as a valuable management tool for measuring progress. In the event that progress is not up to expectations, these criteria should lead to a review process (in addition to the mid-term review already planned) to identify issues and options for remedial action.

The first criterion of success must be that rules for a working structure with well-defined responsibility for oversight on implementation are established and that the top-level functions, activities and product portfolio are agreed upon.

Section 4.5 shows an illustrative set of initial activities that would advance Framework implementation over the first two years, with some of these activities extending into subsequent years. Most of these activities involve capacity development and cover the four priority areas. The Annexes include further details of the activities and provide for their monitoring and evaluation, with measures of quality and success.

Monitoring and evaluation of the implementation of these activities will be done using standard project management tools, reporting procedures, progress reports, etc. The User Interface Platform is well placed to monitor and evaluate how the overall objectives of the Framework are being met, that is, how using climate information fares within the priority areas. There will already be good practice in many cases within each of the four priority areas for monitoring and evaluation, and the Framework should build on these.

In the longer term the success of Framework implementation will be measured by:

- its recognition by governments, along with the level of their tangible support and central role in the Framework, the orientation of national programmes towards its goals and the quality of its intergovernmental nature;
- its ability to leverage necessary inputs through partnerships from United Nations agencies and programmes, stakeholders representing users, managers of observation and climate information systems, research and development organizations and regional and national climate institutions;
- its success in increasing the overall use of climate services and the economic and social impact of climate services provided under its auspices on planning and other decision making in target communities as confirmed by systematic surveys of user communities;
- the increase in climate data and information collected, stored and exchanged globally and regionally;

- the effectiveness of transforming climate research outcomes into sustained climate services as measured by the increase in the range and quality of services available, including number and types of decision support tools and reduction in the uncertainties associated with key climate products;
- its ability to undertake projects funded by aid agencies and other donors; and,
- its ability to attract the resources necessary to sustain its on-going, long-term activities.

The Intergovernmental Board and/or its subsidiary bodies must take responsibility for monitoring and evaluating the Framework's implementation. There are existing panels of climate experts (for example under the World Meteorological Organization's Commission for Climatology, which has a structure closely aligned with the Framework's implementation plans) who could take up a role in monitoring and evaluating Framework implementation. Other stakeholders, in particular users, could provide their perspectives as well.

4.9 Risk management in the implementation of the Framework

The risks associated with implementing the Framework fall broadly into the following categories:

Organizational complexity: Framework implementation will require the involvement of many agencies and institutes at the national, regional and global level. Coordinating these cross-cutting interests in order to develop a sustainable, efficient, operational Framework apparatus will be a complex task. To minimize risk, initial implementation of the Framework should rely on the coordinating role of governments and other key organisations, as determined by the Intergovernmental Board, to tackle a small number of key sectors and expand the range of operations over time on the basis of results and experience.

Initial implementation should minimize risk by building from existing core elements that and gradually expand the range of operations. Proactive coordination with other initiatives is also needed to avoid duplication. A specific risk could arise around data policy although Principle 6 of the Framework calls for free and open exchange of climate-relevant data, which should mitigate this risk. If this risk becomes reality and turns out to restrict progress towards the Framework's goals, a data policy would need to be prepared for consideration and approval.

Leadership and management: Leadership, guidance and management of Framework implementation must come from governments through their representation on the Intergovernmental Board. The Framework will also need a highly-skilled and committed Secretariat. There has been strong support for the Framework from governments and the United Nations system since World Climate Conference-3. Building on this support in

developing the leadership team will minimise the risk of poor leadership. In addition, the United Nations System should provide technical support for Framework implementation.

Resourcing: The rate at which the Framework can grow to its full potential will depend on resourcing levels, including a steady and sustained level of funding and transfer of knowledge and technology. The bulk of the resources necessary to support Framework implementation will come from national and regional contributions supported by governments and stakeholder organizations, with additional support required for the developing world. Demonstrating socio-economic benefits will help secure finances for resources. A risk for the Framework is a low level of engagement at the national level, a risk that must be minimized by highlighting and then demonstrating the benefits of regional and international cooperation. Regional institutions have a key role to play in capacity development, so the risk of their non-engagement must be minimized by targeted programmes that strengthen and bring together regional institutions that can contribute to climate services.

Support for high-priority projects: The Framework implementers should carry out a number of high-priority projects in regions where climate services are least well-developed, most needed and where they have a high likelihood of success. These will include capacity development projects that engage users and providers and that are implemented with resources from aid agencies in partnership with expertise from climate centres currently delivering a range of climate services. Linking with organisations and programmes that already do related work will be essential to developing and communicating best practices, avoiding duplication and minimising the risk of failure, and will offer access to experienced project management capabilities. Technology transfer is also required if the Framework is to fulfil its potential for helping developing countries. The role and involvement of users in all of the above measures is essential and must not be overlooked.

Judicious selection of high-priority projects: It is important that the initial implementation projects are carefully selected to ensure that they are achievable and that they attract sufficient interest from users. Engagement of users in selecting the projects is therefore important. Early success stories are valuable for building confidence and trust in the Framework concept, being mindful to attribute and acknowledge pre-existing activities correctly as well as recognizing organizations' inputs and results.

Communication: The Framework will need strong involvement from providers and recipients of climate services, communities that often do not use the same technical language. For example, climate scientists need to communicate clearly and consistently on topics such as scientific limitations, uncertainty, confidence etc., in ways that are useful to decision makers and should help them develop some understanding of the science on which they are making their decisions. Good communications will help avoid misinterpretation. Scientists also need to take care not to overstate their capabilities so that they maintain their credibility and become the source of authoritative advice.

Conversely, there is a need not to understate their capabilities either. Close contact with users will mitigate these risks and for this the User Interface Platform will be essential.

The ability of the Framework implementers to address the matters listed above and to achieve success in improving everyone's access to climate services will be heavily dependent on the governance and management arrangements that are put in place, as described in the separate Governance Document.

5. ENABLING MECHANISMS

5.1 Synergies among existing initiatives

Principle 7 of the Framework governing principles states that the role of the Framework will be to facilitate and strengthen, not to duplicate, so maximum advantage should be taken of relevant programmes and initiatives already in place. There is, however, only incomplete infrastructure in place to coordinate and drive the generation of climate information. This infrastructure supports collecting and exchanging observations, research, developing products and tools to convey this information, and developing capacity to increase the availability of climate information. Its incompleteness stems from the fact that it is only partially in place, varies greatly in its level of development from country to country, and is largely structured around generating climate information rather than around that information's utility and uptake. Coordination and collaboration across the United Nations system, non-governmental organizations, regional groupings, universities and research institutes as well as governments will therefore be essential.

Gaps in the infrastructure must certainly be addressed, but the technical systems that have been developed, the services currently provided and the experience that has been garnered concerning coordination and user interaction are all of great value and must be leveraged. Defining the desired interactions between the component systems and the Framework, in collaboration with the relevant entities, will be a priority activity.

The World Meteorological Organization Commission for Climatology works closely with the World Climate Programme to obtain and apply climate information and knowledge in support of sustainable socio-economic development and environmental protection. The WMO Commission for Climatology is an example of an existing entity with a very close relationship to the Framework. Major global or regional initiatives such as the Intergovernmental Panel on Climate Change, environmental applications from the European Union's Global Monitoring for Environment and Security (GMES) and the Group on Earth Observations (GEO) are other obvious candidates for a synergistic relationship with Framework implementation.

There are obvious parallels between the Framework and the Global Earth Observation System of Systems (GEOSS). Moreover, GEOSS provides a framework for preparing services such as those that the Global Framework for Climate Services is targeting. As

the four identified priority areas of the Framework are already Societal Benefits Areas for GEOSS (i.e. agriculture and food security, water, health and disaster risk reduction), there is an opportunity for the Framework to collaborate with these ongoing efforts. Furthermore, for each of these areas GEOSS has fostered the growth of Communities of Practice that could contribute significantly to the User Interface Platform. GEOSS has also developed applications and services in collaboration with these user communities that could be shared more fully to advance the Framework implementation. Additionally, GEOSS comprises components that could advance the Framework's goals (i.e. improved discovery of, and access to, climate information; promotion of Data Sharing Principles; involvement of end-users; and capacity building coordination).

There is considerable overlap across the range of climate-related initiatives and a lack of coordination among them can create significant overheads and difficulties. For instance, there is clear common ground in actions required to address disaster risk reduction, climate change and development included in programs such as the Hyogo Framework, UNFCCC, the Millennium Development Goals and the WMO Disaster Risk Reduction Programme. The GFCS can improve the coordination of weather- and climate-related disaster information that flows into these initiatives by seeking to rationalize and streamline the reporting and information requirements expected to be fulfilled by the many contributing institutions.

The Global Climate Observing System, the World Climate Research Programme and the WMO Commission for Climatology are each closely aligned already to the Framework pillars: Observations and Monitoring, Research, Modelling and Prediction, and Climate Services Information System. Yet they diverge from the thrust of the Framework: whereas these existing entities focus with great detail and thoroughness on delivering comprehensive historical, monitoring and prediction/projection information over (largely) atmospheric and oceanic domains, the Framework implementers will have to be concerned with how effectively these observations, research and products are addressing user needs. They will have to look at each of these pillars with a broader scope even if the same completeness may not be required. WMO, through its Executive Council or Congress, is able to exercise a degree of influence on these underpinning programmes that will focus them in ways that can assist in implementing the Framework.

The Framework implementers will take full advantage of existing aligned entities such as GEO in the **Observations and Monitoring** area by ensuring extensive collaboration, cooperation, coherence and coordination. The Global Climate Observing System (GCOS) defines the Essential Climate Variables that are required for climate monitoring in support of the United Nations Framework Convention on Climate Change, but in the implementation of the Framework the suite of required observational data may extend beyond the current GCOS Essential Climate Variables. The GCOS Implementation Plan, which provides estimates of costs, should be used while recognizing that it does not alone provide the roadmap for required observations to support the Framework's implementation. The Framework implementers can also take advantage of existing

activities such as the World Meteorological Organization Rolling Review of Requirements and initiatives within the World Climate Programme such as Data Rescue and climate data management systems. While these activities will not deliver the range of observational information required for a full implementation of the Framework, the expertise that has been developed around building observing systems that deliver information in a sustained manner can be utilized when scaling up for other sector-based observational requirements. For example, socio-economic data requirements in support of the Framework will need to look to the resources of other United Nations agencies, including the United Nations Statistics Division that collates pertinent socio-economic data collected by national or regional bodies from around the globe on a regular basis.

The World Climate Research Programme covers a very wide range of activities that are relevant to the Framework's **Research, Modelling and Prediction** pillar such as:

- The Coordinated Regional Climate Downscaling Experiment
- The Coupled Model Intercomparison Project

Other important coordinating bodies and programmes include:

- The Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization
- The United Nations Environment Programme
- The International Council for Science
- The International Hydrology Programme of the United Nations Educational, Scientific and Cultural Organization

The extensive array of World Meteorological Organization communications networks, global data and producing centres for climate monitoring, prediction and projection will form a strong nucleus for the global component of the **Climate Services Information System**. The global products, largely being developed under the auspices of the Commission for Climatology and the Commission for Basic Systems, will serve as baselines for developing a wide range of regionally and nationally focused products. These products will need to be continually informed by the User Interface Platform to ensure they are delivering products that are standardized but also relevant.

The World Meteorological Organization is also developing a system of Regional Climate Centres that will help meet the requirements of the Framework for regionalized services and for support to national efforts. At the national level, the World Meteorological Organization is promoting a systematic coordination of operational Climate Services Information System activities (data, monitoring, prediction, projection, etc.) within or coordinated by the National Meteorological and Hydrological Services. The World Meteorological Organization Information System (WIS), being the evolution of the Global Telecommunication System and currently under development, is expected to provide the data collection and dissemination services for the Framework. On the whole, the Climate

Services Information System involves formalized structures and mechanisms at all three levels, establishing standards and protocols for data, products and exchange.

As noted in Chapter 1, **the User Interface Platform** is the least developed of the Framework's pillars. Nevertheless, in particular areas of meteorology and climate information across the globe there are some well-developed systems and practices that encourage collaboration between providers and users in developing services and on-going dialogue in their operational delivery, involving users in product development and responding to their feedback. Examples include the Regional Climate Outlook Forums and National Climate Outlook Forums. Such forums could be leveraged in the future to pursue engagement with users outside of climate prediction. The Food and Agriculture Organization, the World Health Organization and the United Nations International Strategy for Disaster Reduction (UNISDR), for example, as well as many other United Nations organizations and non-governmental bodies that have strong relationships with users may also provide guidance. A representative number of case studies of partnerships, interactions and relationships should be documented, including information about what made them successful or caused them to falter.

The need for international coordination is perhaps most evident within the priority sectors. The World Health Organization has been mandated by its Members to globally coordinate across climate and **health** issues. It must therefore be the key partner for facilitating climate-health interactions. The World Health Organization has a long record of collaboration with the World Meteorological Organization dating back to an interagency Memorandum of Understanding in 1952. At the national level, an example of an initiative that addresses climate and health relationships is the climate and health working groups, which have been supported by both agencies in Madagascar, Ethiopia, and Kenya. In addition, there is the Malaria Regional Outlook Forum held in conjunction with Regional Climate Outlook Forums in East and Southern Africa to improve the prediction of malarial incidence. Another national example that addresses climate and health relationships is the United States Government Interagency Crosscutting Group on Climate Change and Human Health.

In **Water** there are a number of United Nations agencies and programmes that have a role to play and they coordinate their activities through the inter-agency mechanism of UN Water. The Global Water Partnership is a valuable network and source of advice on managing sustainable water resources. Regional economic bodies also play an important role in climate and water matters and the Framework implementers should seek to collaborate and coordinate their activities with them.

In **Agriculture and Food Security**, the Food and Agriculture Organization, the World Food Programme, the Technical Centre for Agricultural and Rural Cooperation and the International Fund for Agricultural Development have active partnerships with various United Nations agencies and there is a high level of collaboration that can benefit, and benefit from, the Framework's implementation.

In the area of **Disaster Risk Reduction** there are many initiatives facilitated by the United Nations International Strategy for Disaster Reduction (UNISDR), which serves as the focal point in the United Nations system for coordinating disaster reduction. The Framework's implementation will provide a broadly based context for WMO and UNISDR to improve coordination of weather- and climate-related disaster information throughout the UN System, including its regional organizations and activities in socio-economic and humanitarian fields. It will be advantageous to reach out through other organizations, for instance the International Federation of Red Cross and Red Crescent Societies (IFRC), along with a number of other relevant organisations that can also play a key role.

Among many projects that might be cited is the Map Room developed by the IFRC and the International Research Institute for Climate and Society. This online tool tailors information about extreme weather and climate in a user friendly form, facilitating appropriate action. The WMO's Disaster Risk Reduction Programme has also done some work in partnership with large reinsurance companies, aid agencies and the World Bank in relation to disaster management, particularly concerning financial risk transfer mechanisms such as Catastrophe Insurance/bonds.

Capacity Development is a matter which the United Nations and other bodies, including NGOs, civil society and academia, have been involved with for decades. Requirements for capacity development identified within the Framework will be examined to determine whether existing assistance efforts can be brought to bear on them. The World Bank, the Regional Development Banks and the United Nations Development Programme have very active programmes that include developing capacity in areas associated with climate. The United Nations Development Programme's Climate Risk Management programme aims to assess societal vulnerabilities associated with current and future patterns of risk stemming from short-term climate variability and long-term climate change. It seeks to integrate appropriate risk management strategies into its developmental policies, plans, and projects.

Central Role of WMO

As a key facilitator ensuring coordination among the provider communities, the World Meteorological Organization plays a critical role in the evolution of the Global Framework for Climate Services. It will be central in delivering climate services at the global and regional levels. On the national level, the NMHS can commonly be the entity to deliver climate services. In addition to the initiatives described above, there are many core activities of the World Meteorological Organization that will provide valuable input to the Framework. These include programmes such as the World Weather Watch and the World Climate Programme as well as key developments such as the WMO Information System. It is crucial that these also be leveraged to aid Framework implementation. Given that Congress meets only once every four years, the Executive Council will play a central role, liaising with the Framework's Intergovernmental Board to align these

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elements of the World Meteorological Organization's core business with the business of implementing the Framework.

Congress recognized that the Commission for Climatology will have a central role in implementing the Framework, and many of the activities achieving progress under the Commission have been mentioned earlier. Other technical commissions that will have important roles to play include: the Commission for Basic Systems for routine operational service delivery, observation systems, information systems and data processing and forecasting systems; the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology for marine observations, for marine climate data management and for services to the marine sector; the Commission for Instruments and Methods of Observation for the advice and support in developing new and improved instrumentation for collecting climate-related data; the Commission for Atmospheric Sciences for coordinating the Global Atmosphere Watch and for research into improving climate services; the Commission for Hydrology and the Commission for Agricultural Meteorology for the full range of interactions with users in the water and agriculture sectors.

It is important to remember that it is WMO Members, working together in a coordinated fashion, that support these programmes and technical commissions. The technical commissions should keep their work plans under review as the implementation of the Framework proceeds so that they can give effective support to the initiative and also take advantage of the opportunities it offers.

The Framework's implementation has targeted the regional level as a key focus for collaboration. The WMO Regional Associations can take the lead at this level, particularly in representing the provider perspective, in identifying gaps and indicating communities in each region that are especially vulnerable and requiring high-priority projects. They can foster regional cooperation between RCCs and Members in need, provide some degree of monitoring on regional Framework implementation status and evaluation of outcomes, and facilitate regional resource mobilization. The Regional Associations will be essential for the effectiveness of the Regional Climate Centres and Regional Training Centres and will support them, for example, by identifying what is required to build regional/sub-regional collaborative capacities; assisting in collating user requirements; nominating experts for implementation activities; and gathering support for specific implementation projects.

An initiative of the World Meteorological Organization that has a close relationship with Framework implementation is the development and approval of the WMO Strategy for Service Delivery. A four-stage model of service delivery has been adopted for the Strategy: user engagement, service design and development, delivery, and evaluation and improvement. An Implementation Plan for the Strategy is being developed to focus on assisting the WMO Members to increase their capabilities for delivering weather,

climate and water services. The User Interface Platform, in particular, will need to be closely aligned with this initiative.

There are also a number of working groups, panels and committees that directly relate to or support the Framework. Examples include:

- An Executive Council Working Group on Service Delivery focusing in particular on all aspects of service delivery;
- An Executive Council Working Group on Climate and Related Weather, Water and Environmental Matters;
- An Executive Council Panel of Experts on Polar Observations, Research and Services;
- A Joint expert group from the Commissions for Climatology, Agricultural Meteorology and Hydrology on Climate, Water, Food and Water to oversee and coordinate the activities of each group;
- An inter-commission coordination group on the World Meteorological Organization Integrated Global Observing System to identify and communicate the System's benefits to relevant international partner organizations.

Coordination among participating organizations

WMO and its Global Producing Centres, Regional Climate Centres and Member NMHSs will for the most part be the main providers of primary climate information, i.e. information about past, present and possible future states of the climate system. The Framework, however, is equally concerned with the value that accrues from applying the primary climate information in a wide range of contexts, which will require the involvement of a wider group of information providers. For instance, IPCC is a key initiative designed to deliver authoritative information on climate change including science, impacts and mitigation. How will this climate change information be integrated with climate variability information including prediction, identification and attribution of extreme events? Section 4.2 discusses how the interactions will occur across the global, regional and national levels. For the four priority areas, some examples of climate-related initiatives that have been established are provided above. A key indicator of successful Framework implementation will be better coordination between providing and using partners, thus ensuring that most robust and well targeted climate information reaches, and is taken up by, the users.

At the global level in the first instance, Framework implementation will begin to provide this coordination by opening lines of dialogue between the partners. There is currently overlap in climate-related initiatives such as climate change adaptation, disaster risk reduction, water and health. Better awareness of, and communication between, the relevant UN agencies should facilitate collaboration and reduce the likelihood of duplication. Participation in Framework implementation by these UN agencies will increase their awareness of each others climate-related objectives and initiatives. The

principles for engaging key Partners state that the integration and synthesis of views is important and that this should lead to better use of the limited resources available for climate initiatives by ensuring that duplication is avoided. They also suggest that a forum for representatives of key contributing organisations come together to develop recommendations and views. Such a forum would allow user communities to build awareness of each other's overlapping interests and stimulate consideration of areas of potential collaboration. It is very likely that this exercise would catalyse new cross-disciplinary activities in an efficient and effective manner.

The Secretariat for the Framework will play a key role as a point of information and coordination by providing a well-informed point of contact for interested parties who seek information about their Framework-related activities and interests. It will also produce a catalogue of climate-related activities to which countries and partnering organizations can voluntarily contribute and will list the priority activities requested by the Intergovernmental Board in the Compendium. These functions will provide invaluable intelligence on the range of projects and programmes that are currently planned and active and off of which others can leverage in pursuit of their objectives. These mechanisms should provide some insurance against duplication and will also play a useful role at regional and national levels.

5.2 Building Partnerships within Each Pillar and Across All Sectors

Examples of successful interactions are already evident at each of the global, regional, national and local levels, with partnerships established among a number of different sectors. The Framework is concerned with ensuring that these successful interactions and partnerships between users and providers are mainstreamed. The way in which organizations need to operate together at the global, regional and national levels has been outlined in Section 4.2. The United Nations Agenda 21 plan of action calls for partnerships at the national, regional and global level to tackle human impacts on the environment. Such a cross-disciplinary call to entities that depend on successful use of climate information is an excellent demonstration of how the principles of the Framework can be employed.

Interactions on a national level are often *ad hoc*. There are examples of more formal interaction that include National Climate Outlook Forums and national climate service providers attempting to engage their user communities. There are many countries, however, where interactions do not currently take place at all. One way to bring about a more structured approach to user-provider collaboration is to establish a national coordination mechanism. A framework for climate services at the national level within a country may facilitate building partnerships between the relevant organisations with an aim of delivering more effective climate services. National Meteorological and Hydrological Services would likely be a significant part of this national framework, although there are often other organizations within a country that play a key role in delivering climate services. The precise role that each one played would vary by country,

but the environment should ideally be inclusive. The form of this coordinating framework and the governance around it should be determined on a country level, taking into account each country's existing infrastructure and national needs. Whether a national level Implementation Plan should be developed would be a question worthy of consideration, but again at the discretion of each country.

5.3 Data Policy Implementation Strategy

Restrictions concerning access to datasets can inhibit the development of climate services that may result in loss of benefits to users. Free data exchange would increase and strengthen climate research at national, regional and global levels and would contribute to strengthening operational tasks and applications. Ensuring full and open access to climate data, including to historical records is an important requirement for effectively implementing the Framework while respecting national and international data policies. These requirements are reflected in Principles 5 and 6 (Chapter 1) of the Framework.

Those two Principles suggest that implementing a climate data policy for the Framework should be based around an intergovernmental consensus to exchange climate-related products and data that have been created and are already managed at national levels to meet objectives for the public good while acknowledging the sensitivities of certain data within a country. Resolution 40 of the Twelfth World Meteorological Congress was put in place to ensure data sharing underpins provision of weather forecasts and warnings to save lives. The WMO has established an Executive Council Task Team to examine instances where Resolution 40 is insufficient regarding historical climate data sets and to make recommendations to Congress in 2015 about any additional policy that may be required. In developing an additional climate data sharing policy it would be useful to take account of the data sharing principles that have been employed under GEOSS.

The mandate of the World Meteorological Organization is limited to matters encompassed by the scope of programmes consistent with its Convention. However, to the extent that it succeeded in developing a working policy about exchange of climate data and products WMO could promote this within the United Nations system to encourage its United Nations partners to, adopt complementary data policies. The Intergovernmental Board could be an advocate for such policy development, citing the benefits that would flow from better exchange of climate data.

5.4 Governance, Management and Oversight of the Implementation Plan

In order to implement this plan for the Framework successfully, governance arrangements are required that will support and drive the process in a sustained manner. As suggested by the High-Level Taskforce, governance arrangements should be participatory, consensus-oriented to the extent possible, accountable, transparent, responsive, effective, efficient, equitable and inclusive. These governance arrangements

will include an Intergovernmental Board to oversee implementation and a Framework Secretariat to provide administrative support. The Board and Secretariat would oversee the Framework's activities, including the initial projects, but this should not preclude participants from designing and implementing other activities and projects that fill gaps and address the Framework's priorities.

The Intergovernmental Board of the Framework will be accountable to the World Meteorological Congress and that the management committee structures, which may be accountable to the Intergovernmental Board will provide the overall management of the development and implementation of the Framework and coordination at the global and regional levels.

A Framework Secretariat is established within the WMO Secretariat to provide support to the Intergovernmental Board and Framework implementers. The Framework Secretariat will be accountable to the WMO Secretary General. Its roles and responsibilities will include providing administrative, management, financial, documentary and public relations support to the Board and its subsidiary bodies. An additional role for the Secretariat could include, if resourced to do so, providing technical support to Members in developing national and regional implementation plans as well as assistance in preparing proposals to funding bodies for financial assistance for activities.

5.5 Communication Strategy

The communication strategy will evolve as the Framework is implemented, drawing on developments arising from the Extraordinary World Meteorological Congress in October 2012. The strategy will also be aligned with the communication strategies of other key United Nations Agencies.

The following *objectives*, *target audience*, *messaging* and *tools* set out the initial aspects of the Framework's communication strategy for the early stages of the Framework's implementation. These should all be reviewed on an on-going basis, with revisions made as early successes and challenges are identified.

Objectives

The objectives of the communication strategy are as follows:

- Create and increase awareness about the need for, and benefits of, climate services in helping society adapt to climate variability and climate change.
- Engage support for the Framework from all stakeholders, including the user community, service developers and providers, governments and donors by promoting the significant benefits of the Framework and describing how they will be achieved.

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- Target the user community in particular to raise awareness and to engage it in the process. Active participation in user consultation interfaces and in developing services should be encouraged;
- Sensitise existing and potential stakeholders to the fact that investment in climate services will have cross-cutting benefits, initially in terms of better food security, water management, more effective disaster risk reduction and improved health outcomes.
- Strengthen Framework brand recognition. Build up a ripple effect so that communications are spread outwards from the Framework by different stakeholders and actors in a dynamic and interactive fashion that develops its own momentum.
- Through dialogue, foster a sense of ownership among stakeholders to ensure the long-term viability and success of the Framework.

Target Audiences

The target audiences for the Framework's communications are wide-ranging, covering the stakeholder groups documented in Section 4.2 and including:

- Decision-makers and policy-makers at all levels of government;
- Government advisory services e.g., on cross disciplinary issues
- The donor community, including philanthropic organizations;
- Private sector and business associations;
- Climate service developers and providers, including National Meteorological and Hydrological Services;
- Academic and research institutions;
- United Nations agencies;
- Non-governmental organizations and civil society;
- Civil society and mainstream media via the World Meteorological Organization, National Meteorological and Hydrological Services and other service provider networks.

Communicating the Message

Messages to the target audiences need to articulate how science-based climate information can inform decisions that are affected by climate variability and climate change on timescales from months to seasons to decades ahead. The messages need to demonstrate the economic and/or societal benefits of such information and should link with current political discourse on adaptation and major development goals.

Early successes and case studies should be highlighted, communicated and used to build motivation, enthusiasm for and confidence in the potential of the Framework.

Messaging should aim to translate scientific or technical information into formats readily understood in the language and personal and cultural experience of the recipients. In all communications, use should be made of the appropriate media to take account of the needs and preferences of various user groups, of cultural differences, etc. While traditional methods will be used, advantage should be made of popular new channels such as social networks.

While a major focus of the Framework is on decision makers, outreach efforts should see that the message about the climate and its far-reaching impacts is integrated into school curricula and education of the general population.

Messaging should not focus exclusively on pessimistic scenarios of climate change but rather on stories that illustrate the positive and practical impact of climate services for different users such as subsistence farmers, coastal communities, town planners and structural engineers. Progress in the accuracy and usefulness of weather forecasts has reaped big socio-economic dividends – rewards from progress in developing and applying climate predictions have the potential of being even greater.

Tools

Various traditional and new tools will be used, for example:

- **Web:** Web pages (<http://www.wmo.int/gfcs/>) will serve as a platform to disseminate information about events (past and future), provide online material that can be used at diverse events and allow everyone to comment on the Framework's performance, goals and outcomes.
- **Mobile:** Web access by portable and wireless devices is likely to exceed web access from desktop computers within the next five years. Accordingly, mobile access will be a key channel for disseminating information that has been traditionally supplied through the web.
- **Engagement events** will be conducted such as user consultation workshops, one-to-one meetings, conference speaking opportunities, etc.
- **Social Media:** Social media is also a useful tool for gaining feedback from user groups. It is more interactive and proactive than the web and reaches new audiences, especially among the all-important TGIF (Twitter, Google, Internet, and Facebook) generation, although there will likely be considerable variation in its penetration in countries with diverse cultures and capabilities.
- **Several key stakeholders** (such as the World Health Organization, UN-Water, Food and Agriculture Organization, and International Federation of Red Cross and Red Crescent Societies) have very dynamic social media policies which should be supported with relevant content. Many National Meteorological and Hydrological Services also have a strong social media presence and a unique relationship with their domestic audience, which can be supported with relevant content and endorsements.

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- Use of newspaper articles, opinion pages, letters to the editor and blogs will be used to increase awareness of the potentials of climate service and the role of the Framework.

Actions

- Communications about the Framework will be a central theme of all World Meteorological Organization activities at major events from 2012-2015, including sessions of the Conference of the Parties to the United Nations Framework Convention on Climate Change. The Framework will also be at the core of all World Meteorological Organization basic messaging in meetings in Geneva and New York of the United Nations Communications Group and in meetings of UN Water and the United Nations Chief Executive Board.
- Publicizing the Framework among United Nations Information Centres around the world will ensure that the Framework is integrated into strategic communications on climate-related issues as well as on food security, water, disaster risk reduction and health. This will include giving recognition to the Framework in various United Nations themed Days and Years to multiply the impact of communication activities.
- Reinforcing ties with communications focal points in National Meteorological and Hydrological Services/United Nations country offices will ensure that the Framework is featured in national communications campaigns. Supporting material will be provided for this and feedback will be encouraged from focal points on potential local uses of climate services. Stakeholders will be encouraged to provide people-centred audio-visual material that can be used to promote the Framework.
- There will be outreach to business associations and Chambers of Commerce at international, regional and national levels as well as to large international and national companies who need climate services and are capable of assisting fund raising efforts.
- Relationships will be strengthened with networks of television and radio weather presenters and will include educating them about the differences between weather forecasts and climate forecasts and will outline the respective skills and utility of these types of forecast. These presenters are often key communicators who command wide respect among large audiences.
- More use of video, photos and other media from stakeholders should be made to illustrate the practical benefits of climate services, with an emphasis on the human angle to bring alive the relevance and importance of the Framework.
- Awareness among media will be increased concerning the practical importance of climate services. Partnerships will be fostered with media associations, especially in developing countries.

6. RESOURCE MOBILIZATION

6.1 Introduction

Continuing investments by governments to provide climate services and climate infrastructures within their own countries, together with programmes of stakeholder organizations within their on-going mandates, will supply the major part of the resources associated with the Framework. The task of implementing the Framework in the developing world, however, will require additional support for:

- Addressing the weaknesses and gaps in their current systems (as outlined in Chapter 3), particularly with a view to making a significant, early impact in parts of the world that are seriously deficient in climate infrastructure; investment in Information and Communications Technology systems will be part of this effort;
- Translating climate knowledge into aids for effective decision making in the priority sectors (and later in other sectors);
- Enhancing the climate resilience of the most vulnerable parts of the world and facilitating decision making for climate adaptation.

Implementing the Framework will therefore require commitment from governments and development agencies using the full spectrum of national and international development financing mechanisms and through leveraging related financial and technological initiatives and partnerships. Private sector engagement will also be essential. At the same time, funding sources must facilitate cooperation between public and private sector entities and be sustainable. Utilizing financial mechanisms that reinforce cooperation, enhanced by knowledge exchanges between developed and developing countries, is also crucial.

In the current financing environment it is critical that the wider national and regional socio-economic development context is taken into account in seeking support for the Framework. The contribution of Framework activities to climate change adaptation, to the achievement of the United Nations Millennium Development Goals, to other internationally agreed development goals and to sustainable development must be clearly emphasized, as well as their beneficial effects on national development plans and action plans in developing countries.

6.2 Developed countries

In the developed world the Framework will aim to achieve recognition of the critical need for investment in all elements of the climate services chain within the national system in order to facilitate climate-resilient economic development decisions and investments for protecting lives, livelihoods and property. To achieve this, significant efforts will need to

be made to raise policymakers' and decision-makers' awareness of the need to invest in their national climate services, with users playing a leading role in these efforts. The recognition that the effectiveness of national climate services requires an adequate global system (especially for climate observations and monitoring) should prompt governments to consider providing assistance to countries that might struggle to fulfil their role within such a system. This recognition will require a concerted effort on the part of the key national agencies responsible for climate issues, supported as necessary by partner agencies of the United Nations system and other development partners, to make a strong case for investment in climate services within national budgeting processes.

In relation to research elements in particular, the greatest investment here will need to be borne by national governments through normal fiscal processes, to provide budget support to national scientific, research and academic institutions. Investment will also be needed from the private sector. Traditional international financing mechanisms tend to support operational systems rather than research, but research funding from regional intergovernmental communities may also be an option.

6.3 Developing Countries

In the developing country context the challenge is immense. The Framework will need to be built on mechanisms and institutions for the most part already in place. In most developing countries the providers of climate services are largely the National Meteorological and Hydrological Services. Climate services that exist are, and are perhaps best provided as, a seamless continuum from weather services to climate projections.

Resourcing the Framework will therefore need to focus on ensuring that the national providers of climate services are adequately resourced so that they can contribute effectively to national socio-economic development by delivering effective and efficient climate services that help protect life, property and the environment. Organizations that can mobilize users and assist in realising the benefits of climate services also need resources.

The challenges here will be to capitalize on all potential sources of direct and indirect funding including direct financing, technology transfer and sharing of expertise. It will also be necessary to leverage related initiatives that are not directly related to climate services. These initiatives could nonetheless benefit Framework efforts if it is seen that their objectives would be better realized by investing in climate services.

In this context, resource mobilization means first taking advantage of *ad hoc* opportunities to develop small- to medium-scale projects in response to calls from various user groups. More importantly, it means developing in parallel a strategic programme of activities aimed at securing sustained resourcing to provide climate

services in developing countries. This effort could be integrated with regional and national strategies, for instance.

To enhance the level of in-country and external support to climate services in developing countries it is imperative to advocate strongly the importance and value of climate services to national development efforts. In this respect the Framework will constitute a platform for national agencies in their efforts to demonstrate the social and economic value and benefits of climate products and services to their political leaders, along with outlining their role in achieving development targets and in securing commitments for financial support for basic national activities that serve national needs.

There are a host of investment mechanisms that can be approached for additional investment to enhance all components of the climate services system or to leverage investment in related sectors. These include:

- National budgeting processes;
- United Nations System initiatives;
- Development Bank investments;
- Development assistance programmes of economic groupings such as the European Commission, Asia-Pacific Economic Cooperation, Association of Southeast Asian Nations, Economic Cooperation Organization (west Asia), African Union, Organization for Economic Co-operation and Development;
- Overseas Development Assistance programmes of national governments, including aid agencies;
- In-country budgets of overseas missions and embassies;
- The various Climate Investment Funds;
- The Global Environment Facility.

Finding an alignment between the stated priorities of the various financing mechanisms and the priorities identified in regional and national Framework-related plans will be achieved by actively engaging donors as Framework partners.

6.4 Funding sources

Possible funding opportunities that might be considered by the Framework in connection with its activities are listed below.

Development Banks

Financing provided by the World Bank and Regional Development Banks (African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, etc.) is generally negotiated directly with the Ministries of Finance of the respective recipient countries using various methods (grants, soft loans, loans, etc.). It will be critical that these development financing bodies

and the governments that use them recognize the value of climate services and make a strong commitment to the principles and objectives of the Framework and to their realization at the highest levels. Their support for building Frameworks for Climate Services at the National Level would demonstrate this commitment.

The World Meteorological Organization and various World Bank Programmes have come together in recent years to focus financing significantly towards modernizing the hydro-meteorological sector, including its climate aspects. There are already strong programmes in Southeast Europe and in Central Asia that have both regional and national components. Similarly, activities are under consideration in Africa.

Climate Funds

By pledging multi-billion dollar amounts in dedicated finance annually, governments have ushered in a new era of funding for dealing with climate change. Only ten years ago, climate finance was managed by a small number of large funds associated with the United Nations Framework Convention on Climate Change. Today, there has been an explosion of public, private, bilateral and multilateral sources offering countries new opportunities to address their climate and development needs, although it is still an open question as to whether this financing will be commensurate with the needs of developing countries. The following are the key Funds related to climate change that countries might approach in support of the Framework:

- **Adaptation Fund:** The Adaptation Fund was established by the Parties to the Kyoto Protocol of the United Nations Framework Convention on Climate Change to finance concrete adaptation projects and programmes in developing countries that are Parties to the Protocol. The Fund is financed by 2% of the Certified Emission Reduction issued for projects of the Clean Development Mechanism and from other funding sources. Many projects that have already been approved include a climate development or support component.
- **Climate Investment Funds:** The Climate Investment Funds acknowledge the need to provide additional financial resources to developing countries in order to help them mitigate and manage the challenges of climate change. The funds are channelled through the African Development Bank, Asian Development Bank, European Bank for Reconstruction and Development, Inter-American Development Bank, and World Bank Group. One such fund, the Strategic Climate Fund, is concerned with climate-resilient development and funding for the Pilot Programme for Climate Resilience was arranged under its auspices. This programme aims to pilot and demonstrate ways in which climate risk and resilience may be integrated into core development planning and implementation, an objective that aligns well with the Framework. More than 60% of the projects within this programme portfolio have a strong meteorological (including climate) component.

- **Green Climate Fund:** The Green Climate Fund was founded within the domain of the United Nations Framework Convention on Climate Change as a mechanism to transfer money from the developed to the developing world, in order to assist developing countries in adapting to and mitigating climate change. It was designed with the goal of becoming the main multilateral financing mechanism supporting climate action in developing countries. The Fund is a legally independent institution, with its own separate secretariat and the World Bank as its interim trustee but functions under the guidance of, and is accountable to, the Conference of the Parties to the United Nations Framework Convention on Climate Change. The biggest challenge for the Green Climate Fund will be to secure adequate and sustained funding.
- **The Global Environment Facility (GEF):** The Global Environment Facility is an independent financial organization that provides grants to developing countries and to countries with economies in transition for projects related to biodiversity, climate change, international waters, land degradation, the ozone layer and persistent organic pollutants. These projects benefit the global environment, linking local, national, and global environmental challenges and promoting sustainable livelihoods. The goal of the GEF in climate change mitigation is to support developing countries and economies in transition in moving toward a low-carbon development path. As an operating entity of the financial mechanism of the United Nations Framework Convention on Climate Change, the GEF finances eligible climate mitigation and climate adaptation along with associated enabling activities. The GEF Trust Fund supports mitigation and enabling activities, including fulfilment of Convention obligations. The Least Developed Countries Fund was established under the Climate Convention and is managed by the GEF. It helps finance the preparation and implementation of National Adaptation Programs of Action and thus focuses on reducing the vulnerability of those sectors and resources that are central to development and livelihoods such as water, agriculture and food security, health, disaster risk management, infrastructure and fragile ecosystems. The Special Climate Change Fund (also established under the Climate Convention) supports adaptation and technology transfer and long-term and short-term adaptation activities in water resources management, land management, agriculture, health, infrastructure development, fragile ecosystems and integrated coastal zone management.

While this increasingly broad landscape of climate change funds provides increased resources, it also brings increased complexity. Requirements, processes and reporting can differ among the funds and so countries are faced with the challenge of identifying which funds are appropriate for them, determining how they can collect resources, figuring out how to blend them together, coordinating the actions funded by them and developing methods to monitor and evaluate the results. Given the diversity of funds, it is critical that countries build on existing institutions and programmes to manage resources at the national level to support country-driven objectives.

United Nations system

Initiatives of the United Nations agencies and related partners involved in direct country assistance and financing include, in part, those of:

- Food and Agriculture Organization;
- International Fund for Agricultural Development;
- United Nations Development Programme;
- United Nations Educational, Scientific and Cultural Organization;
- United Nations Environment Programme;
- World Food Programme;
- World Health Organization;
- World Meteorological Organization.

These United Nations agencies are likely to play a meaningful role in the Framework's Governance mechanisms and will be encouraged to integrate the Framework into their Country Programmes. Options for funding some Framework activities from voluntary contributions programmes operated by the agencies and for setting up special trust funds (with Member States invited to contribute) should be considered. The World Meteorological Organization has set up a Global Framework for Climate Services Trust Fund that has attracted contributions from a number of countries. It helps fund some initial projects and administrative costs. The concept of trust funds to collect and administer contributions supporting the objectives of the Framework may continue to be a useful device.

Mainstreaming the Framework into development initiatives of the United Nations agencies will be a key component of resourcing for Framework implementation through direct financing and also by leveraging related activities.

Overseas Development Assistance

There is a strong focus on water, environment and health in Overseas Development Assistance programmes, all of which are highly relevant to the Framework. There is an increasing awareness among these programmes of the potential role of weather and climate in stalling or slowing down economic development and poverty alleviation and, conversely, in supporting climate resilient development. There is awareness, therefore, of the need for improved weather and climate services. Additionally, some direct interest and investment in enhancing climate services is indicated by support of countries for the Framework and for relevant projects in developing countries.

Increasing the number of climate service providers, including National Meteorological and Hydrological Services, engaged with their Ministries of Foreign Affairs and their respective Overseas Development Assistance Programmes to direct financing towards

projects for capacity development related to climate services will be a key element of the Framework resource mobilization effort.

At the national level, most of the above financing mechanisms are country driven, with investments directed by the stated priorities of national governments, and are negotiated directly between the national government and the financing agency. They are generally of a bi-lateral nature, or (in the case of Climate Investment Funds) can only be accessed directly by countries rather than by regional or international bodies. National agencies working in the climate field can, therefore, play a key role in resourcing Framework implementation by ensuring that Framework interests are taken into account in the interactions between their governments and all of the potential financing and support mechanisms. Moreover, the provision of financial resources by developed countries to developing countries to implement Framework -related projects is crucial and is central to building confidence in the Framework and to ensuring its ultimate success.

Private Sector

While much of the responsibility for driving climate change solutions that address the needs of the poorest and most vulnerable rests with governments, it has become increasingly clear that business will be an essential partner in preparing for and responding to the impacts of a changing climate and in building a global green economy. The challenges that communities in developing countries face as a result of climate variability and climate change — such as more frequent and intense storms, water scarcity, declining agricultural productivity and poor health — also pose serious challenges for businesses.

Community risks are business risks. Both local and global companies depend on community members as suppliers, customers and employees. They also depend on local resources, services and infrastructure to be able to operate. It is difficult to separate community well-being from companies' viability and, in turn, from overall economic growth. The economic value of climate services applies to the private sector as much as it does to the community at large. The private sector has much to contribute to developing and implementing climate change adaptation solutions, including sector specific expertise, technology, significant levels of financing, efficiency and an entrepreneurial spirit. Companies that rigorously assess climate change risks and opportunities and implement creative solutions that build long-term resilience will create business value while making important contributions to sustainable development and equitable green growth.

The Framework could be used as a platform to consider new forms of public-private partnerships for building climate services to tackle the most complex challenges to sustainable development and climate resilience. The key is to find a nexus of shared interest, at relevant geographic scales, where business incentives align with communities' adaptation needs The United Nations Global Compact Caring for Climate

initiative, a joint United Nations Global Compact platform involving more than 400 businesses committed to advancing climate action, provides an avenue for bringing the Framework to the private sector and for engaging in dialogue on how the private sector can provide support.

6.5 Role of United Nations system and development partners

The United Nations agencies that are partners in the Framework, along with other organizations, can assist both developed and developing country situations by:

- Helping to identify development needs at the regional and national levels;
- Sensitising development partners and national governments to the value of climate services and the benefits that building greater capacity can bring to a variety of users;
- Advocating the importance of climate monitoring and climate change adaptation and disaster risk reduction;
- Strengthening collaboration between developed and developing countries climate service providers;
- Assisting national agencies involved in the provision of climate services to avail of funding opportunities within the national system by raising their political and public profiles;
- Supporting advocacy programmes at the national and regional levels;
- Assisting national climate service providers in demonstrating the socio-economic value of their products and services by using case studies to inform their governments and communities on this subject through targeted social marketing mechanisms;
- Building a portfolio of case studies with a strong sectorial basis that demonstrate the socio-economic benefits of weather and climate services and the return on investment in terms of averted losses (lives, property, livelihoods) and economic gains (agriculture, transport, tourism, health, etc.) from enhancing these services;
- Providing technical assistance in their areas of expertise;
- Standardizing methodologies for evaluating and demonstrating the socio-economic benefits as well as creating guidelines for best practice;
- Assisting national climate service providers to establish and engage in mutually beneficial relations with the private sector and create private-public partnerships as appropriate. There could be potential for public-private sector interaction related to financing climate services.

6.6 Challenges at global, regional and national levels

It is useful to summarise the challenges of resourcing the Global Framework for Climate Services by using the three geographical scales that form part of the structure of the Framework. At the global level the task is to raise awareness among potential global partners such as United Nations agencies, multilateral development banks and donors

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and to encourage them to consider climate service projects as suitable candidates for their capacity development activities. Major advocacy efforts will be made in relation to funding bodies such as development banks.

At the regional level, opportunities for funding regional activity will arise, most likely involving regional economic communities such as those in Africa, Asia/Pacific and Europe. While development programmes are usually organized on a country basis, there are examples of regional activity being supported, as in the case of the African Monitoring of the Environment for Sustainable Development project which is supported by the European Union.

At national and local levels the value of climate services will be advocated to governments and other sources of national funding so that Framework activities may attract funding through national budgeting processes and by other means. Requests for development funding for climate services made by countries to development banks and other funding options will also require efforts at the national level to mount strong cases for assistance. National contributions to support capacity development in developing countries and to fill the regional, national and global gaps identified within Framework components will benefit all people by creating a more equitable and sustainable world.

A useful step would be to compile a catalogue of Framework-related activities/projects that is regularly updated. This catalogue could be used to provide an accounting of initial implementation activities under the Framework and serve as an aid in generating support. Demonstrating the value of the Framework by offering practical evidence of results arising from investment is vital to ensuring that confidence in the Framework will grow.

7. CONCLUSIONS AND NEXT STEPS

The nature of the challenge posed by climate variability and climate change caused by human activity is unprecedented and requires a response in proportion to the scale of the problem. The Global Framework for Climate Services presents an opportunity to apply the benefits of our knowledge of the climate and of existing climate infrastructure to help respond to this challenge and alleviate suffering while contributing to economic prosperity and sustainable development.

The Framework can enable society to manage the risks and opportunities arising from climate variability and change better, especially on behalf of those who are most vulnerable to such risks. This objective will be achieved through developing and incorporating science-based climate information and prediction into planning, policy and practice, accompanied by efforts to improve our understanding of climate, our predictions of climate, and, more importantly, our use of climate information to serve society's needs better.

This Framework will build partnerships, mobilize resources, coordinate activities and facilitate the development of sustainable structures that are needed to serve society's needs effectively with regard to services based on climate information. The Framework is intended to be long-lived, and this Implementation Plan is only a first step at achieving this long-term vision.

A partnership approach involving all relevant stakeholders at global, regional and national levels will be essential for the Framework to succeed. The Framework will need to ensure strong engagement from United Nations Agencies, other international organizations, existing climate service-related programmes, users, providers, donors, governments, private sector organizations and National Meteorological and Hydrological Services, most of whom have a strong weather service remit but not one for climate services that is sufficiently strong. A governing principle of the Framework is that existing systems and programmes should be built upon, that existing knowledge and good practice be drawn upon and that full advantage is taken of synergies with all existing, relevant activities.

A structure that will help realize these benefits has been outlined. A key element in that structure is that climate services should be based on the needs of users; therefore a major component of the Framework (the User Interface Platform) will ensure that dialogue and feedback with climate service users will be a central part of the process so that their needs are identified and they guide the production and delivery of services. Another key element is the Climate Services Information System, the principal mechanism through which information about climate will be routinely collated, stored and processed to generate products and services that help inform often complex decision-making across a wide range of climate-sensitive activities and enterprises. As part of the functioning of this system an examination of issues relating to policies governing the

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availability of climate data needs to be conducted in order to maximize the availability and use of data for developing and delivering services. Other parts of the Framework structure include underlying observational and monitoring along with research, modelling and prediction components that provide a foundation for climate services. The need and importance of capacity development in all aspects of climate service provision and use is recognised throughout the structure.

In implementing the Framework, the global, regional, national and local aspects of climate service provision and use will be addressed. An important element of this approach is to identify deficiencies in all parts of the production, quality and utilization of climate services as they currently exist. These analyses will help form the basis for actions that will lead to better climate services for everyone.

The Framework will be implemented through activities and projects that will be enabled by mobilizing the necessary resources with associated funding. In the initial stages (at least the first two years) the Framework will prioritize developing and delivering services to ensure better food security, enhanced water management, more effective disaster risk reduction and improved health outcomes. These areas are being focused on because they offer the most immediate opportunity to bring benefit to decision making at all levels and to have a consequential impact on human safety and well-being. As the Framework evolves, the needs of users in other sectors will be considered. The Framework will also place priority on building the capacity of climate-vulnerable developing countries. This does not mean that the needs of developed countries will be ignored, since capacity development applies to all. This Implementation Plan identifies a series of initial activities that will quickly address the priority areas, primarily to deliver benefits to, and develop capacity in, developing countries. In so doing this will demonstrate the value of the Framework to all its stakeholders (be they providers, users or donors), ensure sustained and expanding support for and commitment to it, and ultimately to deliver greater benefits to more parts of society.

Following approval of the Implementation Plan, the activities outlined in it will be carried forward by the appropriate institutes and agencies, developing more detailed project plans for the series of initial activities. Other aspects of the Implementation Plan will also need to be acted upon, for example, the governance structure, the communications strategy and the resource mobilization strategy. While the Implementation Plan focuses on the global framework for climate services, there would be merit in many regions and many countries in developing and implementing the concepts of frameworks for climate services at regional and national levels. Such concepts are starting to emerge, at least at the national scale, and while there may not be a universal approach to such frameworks, there is useful learning available from those who have embarked on this already.

Finally, while providing climate services is not new, this Global Framework for Climate Services represents a major, concerted and coordinated global effort to improve the well-being of all parts of society vulnerable to climate variability and climate change.

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There are existing mechanisms and institutions providing climate services (in a less coordinated way) and other activities and development plans such as the Millennium Development Goals and the United Nations Framework Convention on Climate Change and the Framework will be aligned with such activities, will benefit from them, and vice versa, but will go beyond them by coordinating the structures required for delivering needs-driven climate services across the globe.

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